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MECCANO MAGAZINE

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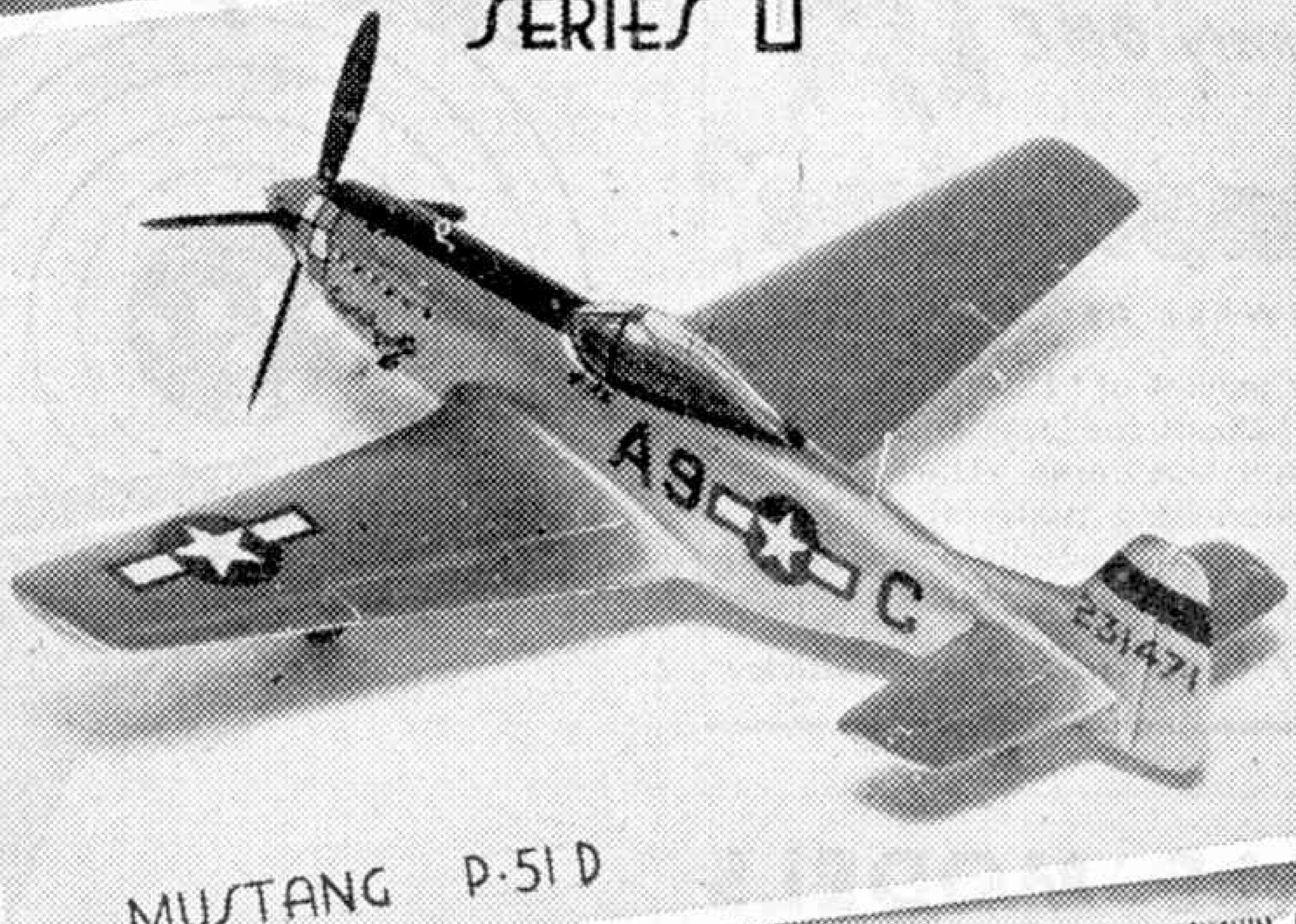

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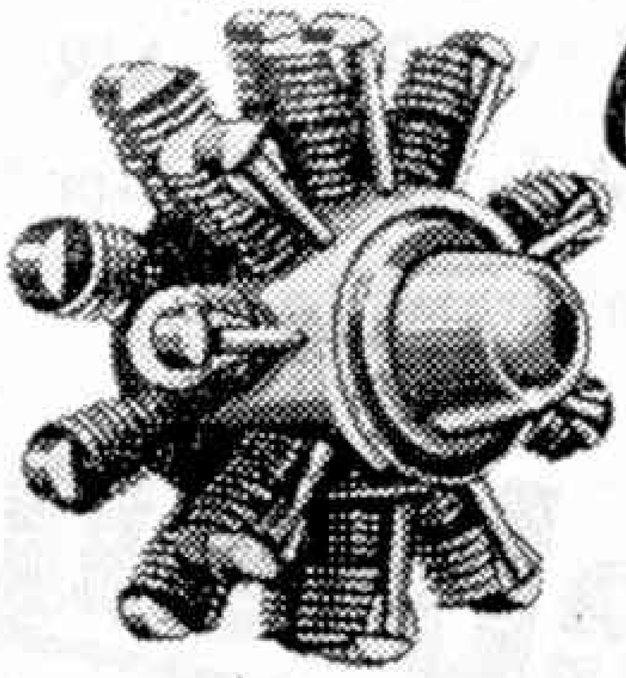

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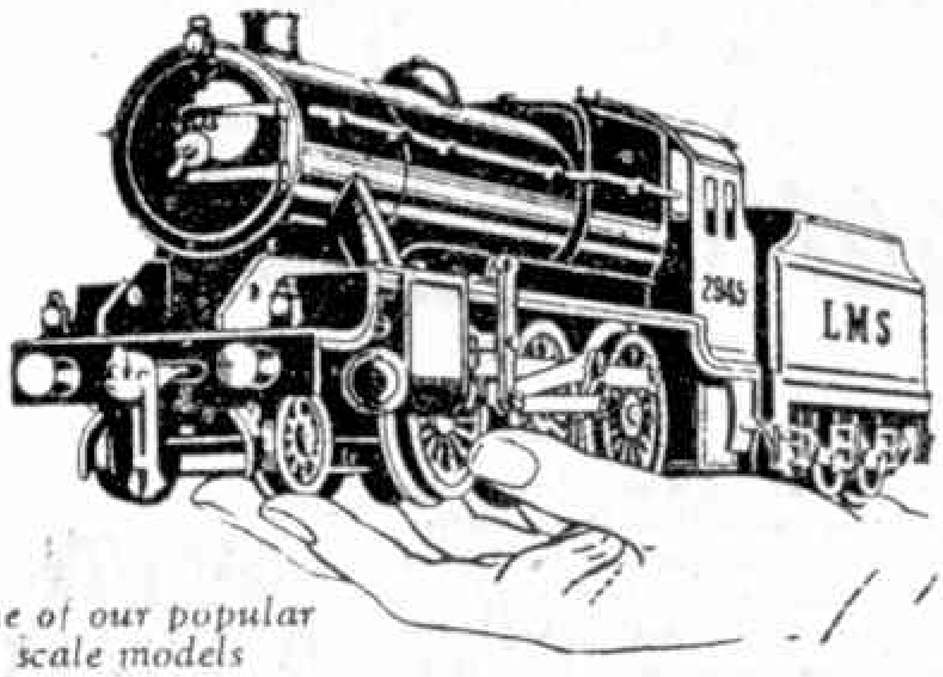

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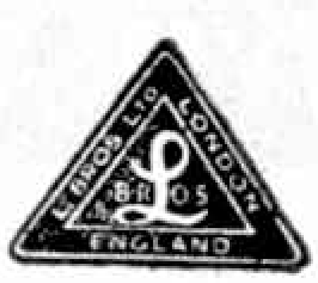

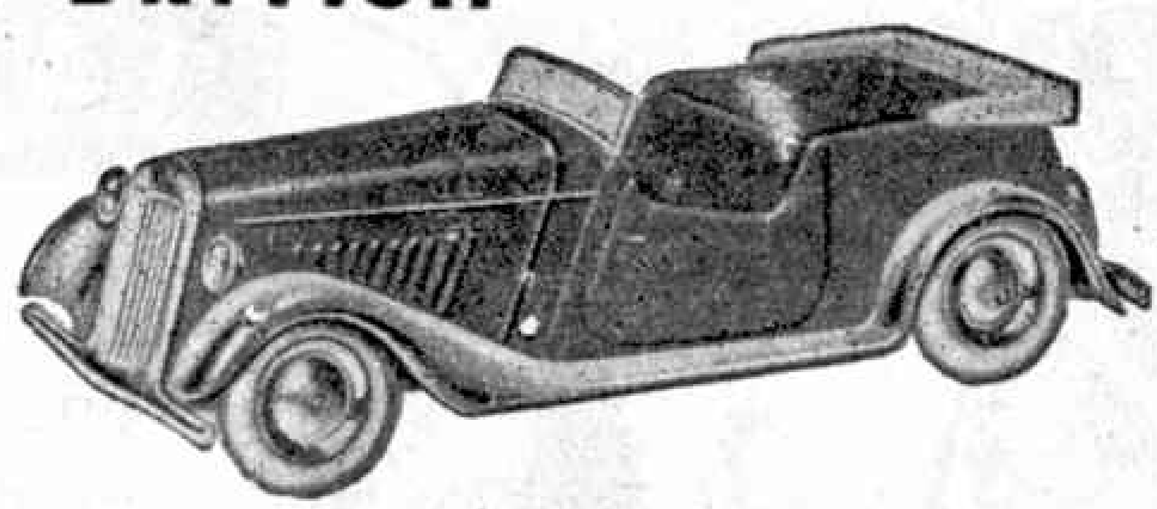

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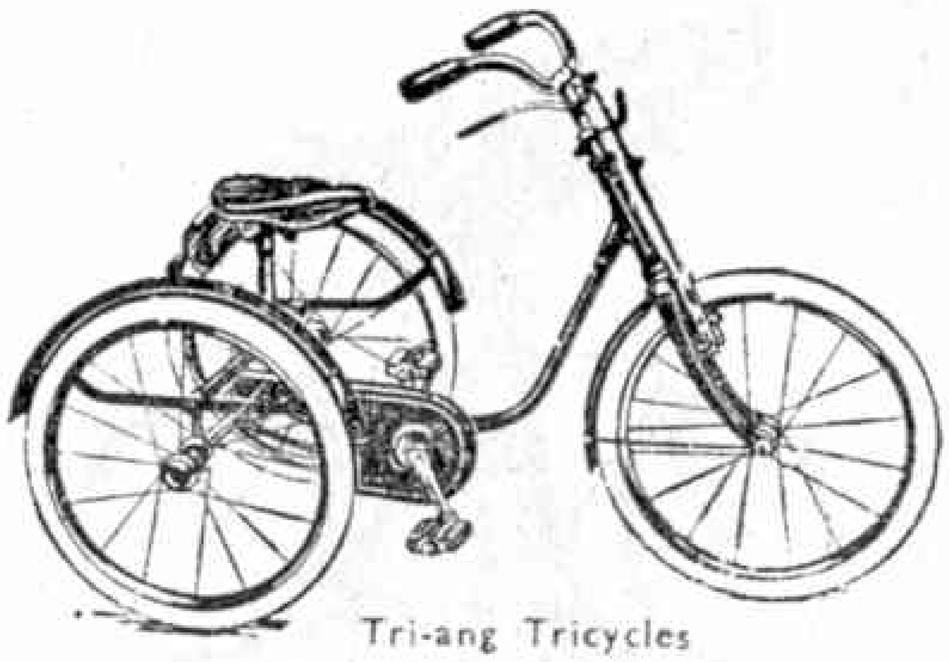

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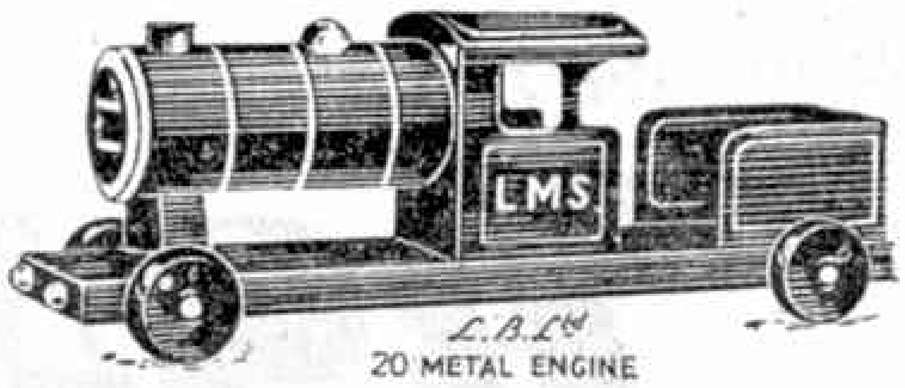

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MECCANO MAGAZINE

Editorial Office:
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Vol. XXXI
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February 1946

With the Editor

One Hundred Years Ago

It is particularly interesting just now to look back 100 years because 1846 was a remarkable railway year. Railways were then in their infancy, but the great success of the Liverpool and Manchester line and other ventures in various parts of the country led to immense enthusiasm for the new mode of travel. By 1846 the country was right in the middle of what is known as the "Railway Mania," a period when people simply went mad over the new development and rushed to put their money into railway schemes, many of them perfectly absurd.

Good came out of this period, for in it the railways of this country began to take shape, and comparison of a railway map of Great Britain in 1846 with one of to-day is very interesting. King's Cross and St. Pancras had not yet been built, but Euston, Paddington and London Bridge were there. Birmingham, Liverpool and Manchester had been reached, and although the East Coast line was not yet in existence it was possible to travel by rail to Newcastle by way of Rugby and Normanton. To the north there was still a gap, but Edinburgh had been joined to Glasgow on the one hand and Berwick on the other. In the South, Brighton, Dover and Southampton had been connected by rail with London, and of course there was Brunel's G.W.R. line to Bristol, which by that time had been extended to Exeter.

Though railways were taking shape, we were still in 1846 very far from the position to-day, when almost any one of us can walk out of his home to a station not many miles away at the farthest, and set off on travels by rail that will take him direct to any place of importance in the country. Except in the Highlands of Scotland, railways can now take us within a few miles of almost any chosen destination.

The change since 1846 becomes even more impressive when we consider the rest of the world. The run of *"The Olympian,"* described on page 52 of this issue, reminds us that to-day there are many trains that cross continents with clockwork regularity. Yet in 1846 the very idea of such a development would have seemed absurd. Incidentally, it is worth while remembering that 100 years ago the aeroplane and diesel or diesel-electric engines to drive huge liners were not even dreamed of, and Radar would have been regarded as something akin to witchcraft.

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Walking the Welsh Marches

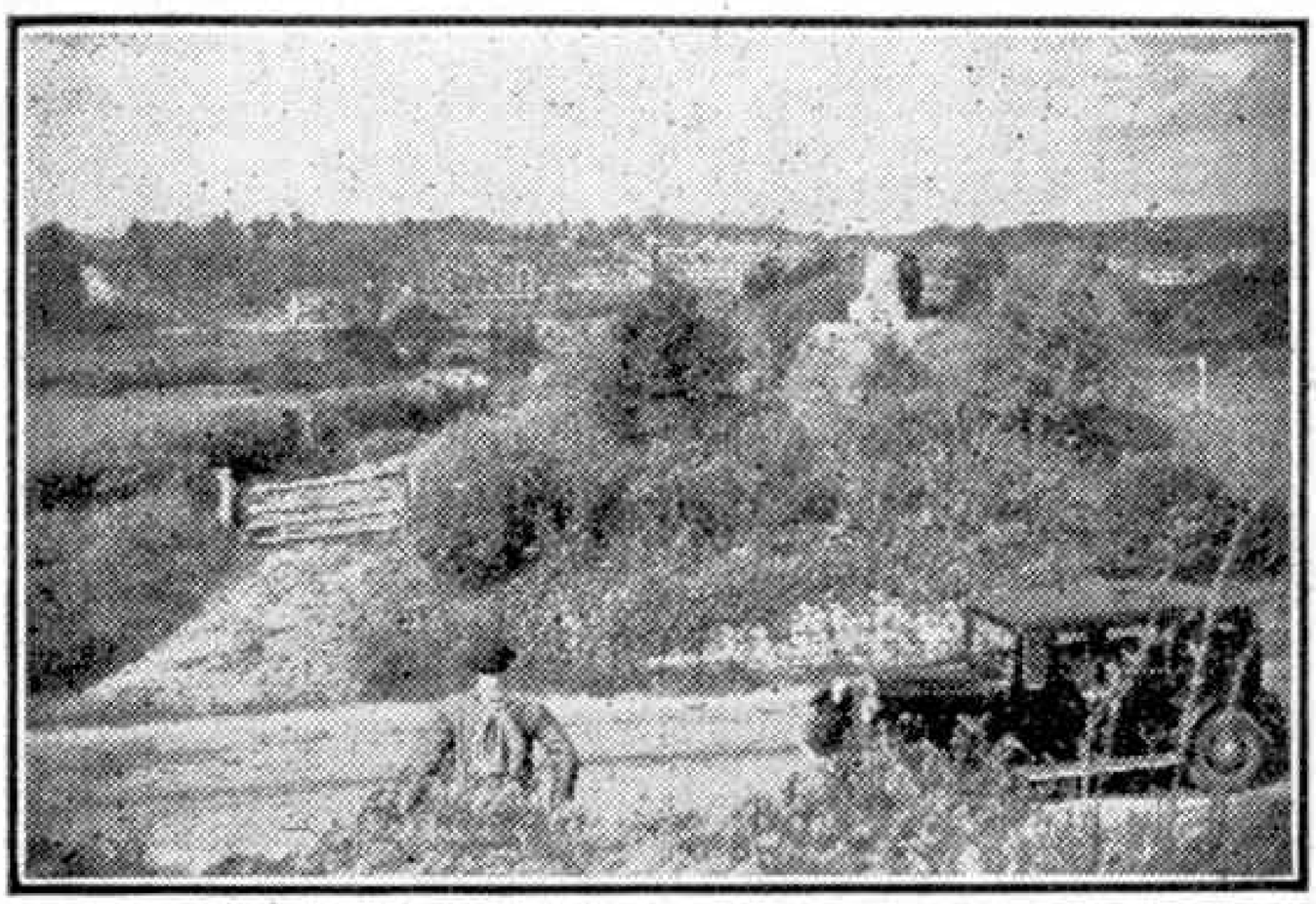
By Garry Hogg

ENERGETIC walkers and map-readers among "*M.M.*" readers who are looking for something new in the way of a tramping holiday this year might do worse than follow the line of Offa's Dyke, that little-known earthwork built 1200 years ago as a line of demarcation between the turbulent Welsh and the more settled Saxons of Mercia, the country we know to-day as the Midlands. Very few people seem to have heard of the Dyke, and fewer still seem to know where to find it. That indeed is a great part of the charm of such a walk, and if the Dyke is less lonely than the Pennine Way, which I walked and described for "*M.M.*" readers last year, that is only because it lies in less arduous country; you will walk all day and meet no one but an occasional farmer, but if you want company, or a bed, or a meal, you have much less far to go from your track than you have along the Pennines and Cheviots.

Once again maps are essential, and a compass is too. I walked the Dyke from the south northwards, so that the references in this article must be read in that order. First as to maps. The one-inch O.S. series are really essential, for this Dyke lies through open country for the whole of its 150 miles or so and is not sign-posted, though often a farmstead or cottage on its line will betray its presence, when the Dyke itself is obliterated, by some such name as Plas Offa or Pen Offa. The coloured edition, with the grid superimposed on it, will be found most useful for the purpose, and the maps you will need are numbered 103, 92, 80, 70, 60, 51 and 43. If you open them out and fit them together you will find that the Dyke runs very nearly south to north between Chepstow on the Severn-Wye peninsula and Prestatyn on the North Wales coast. For convenience I cut my maps into strips about eight inches wide and gummed them together bottom-to-top so that I could carry a couple of days' walking folded into a handy wallet-size notebook. Where the Dyke has been identified by the Ordnance Survey it is marked with a double-dotted line, and carries the name. Where its position is not certainly known, the lettering that appears is "*Offa's Dyke—site of.*" Where it has been obliterated by plough and harrow or running water or, as in the northern sections, by road building and collieries, you have to guess at its probable line by joining up known sections on the map and then looking for the sort of contour on which you may reasonably suppose it was built.

How will you know this? Here is the answer. The Dyke was originally a high earth wall with a deep ditch on the western or Welsh side, and sometimes a smaller ditch on the eastern side as well. It was built by the Saxons, so naturally the builders were careful always to build it where it gave them advantage in the event of trouble with the Welsh. So you will find it clinging to the steep slopes where they fall away westwards. Where there is water, as along the Wye section in the south, it naturally rides along the eastern bank. Where it crosses a flattish valley, as in the path of the River Clun, you will probably find a building of substantial stone on the actual spot where it met water; this building will be a modern farm, but almost certainly built on the foundations of some stronghold erected by the Saxons to strengthen their position where the Welsh could

The highest point of Offa's Dyke, on Llanvair, 1,408 ft. above sea level.



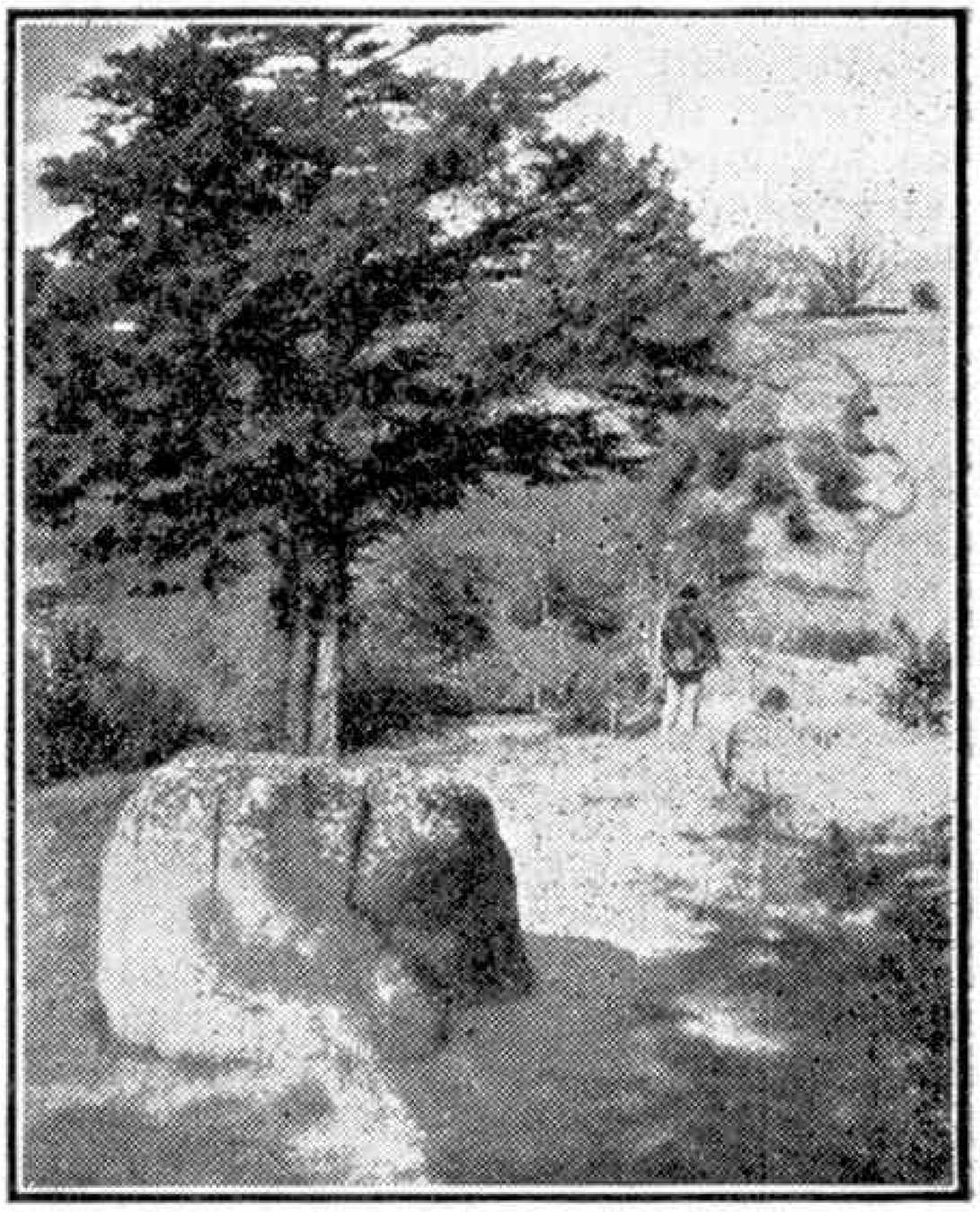
Buttington Tump, Chepstow. The ditch of Offa's Dyke runs through the gateway to the left of the Tump.

follow the line of the running water. Bryndrinog Farm, near Newcastle in the Clun Valley, is a perfect example of this. There you can trace the embankment as it climbs up from the water northward, through the farmyard and up over the 1,200 ft. top of Graig Hill.

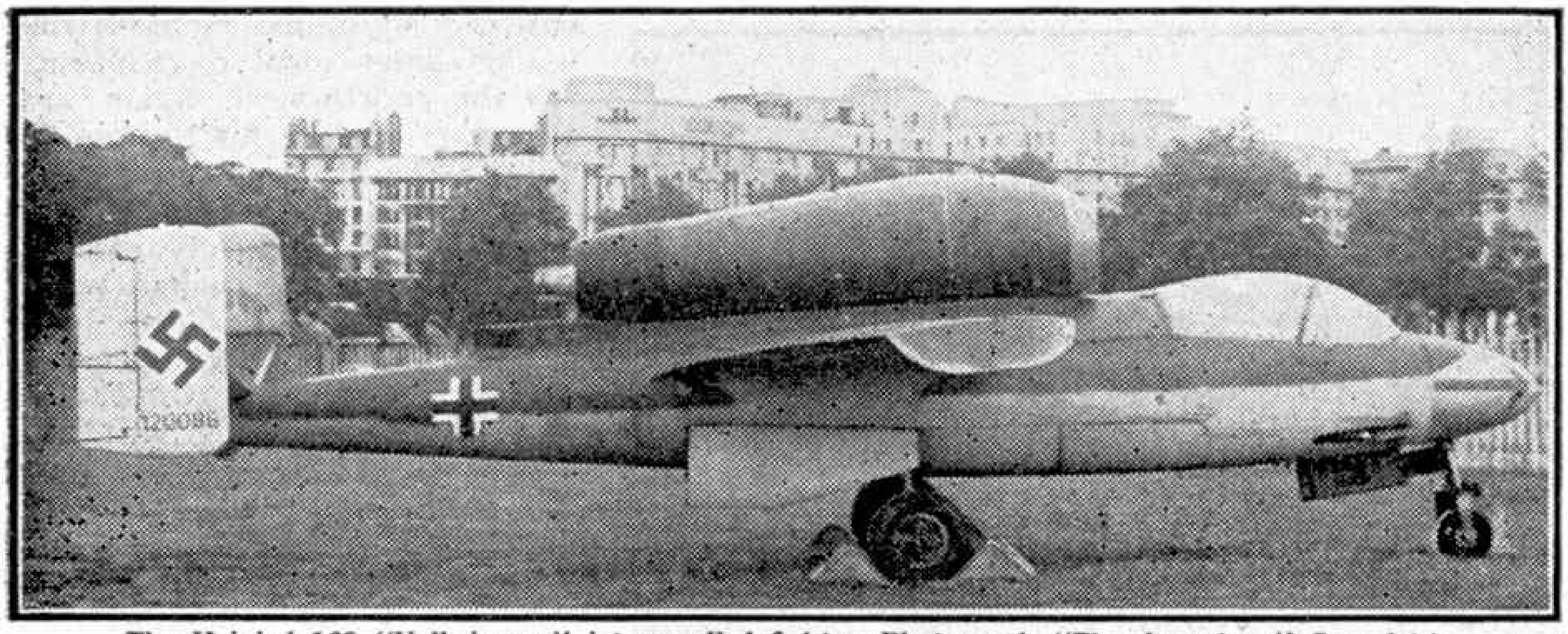
It will detract a great deal from the adventure of tracking down this ancient earthwork if I give you all the landmarks, but a few of the places near or through which it may be followed should be looked out on the map and underlined. It begins on Sedbury Cliffs, a mile south-east of Chepstow, marked by a great lump of "pudding-stone." It then follows the Gloucestershire bank of the Wye, through thick woods, often on the 500 ft. cliffs above the river, for about 10 miles, to Redbrook, where it is completely lost until it reappears north-west of Hereford, at Bridge Sollers. Then it runs, north-westwards, often broken for miles at a stretch, missing Kington by a mile or so and heading for the heights of Rushock and the Herrock Hills. Its highest and finest stretch follows, north again towards Knighton. It reaches its highest point on Llanvair, over 1,400 ft. up, and here you will see with what skill the old builders used the steep contours that overlook Wales.

The Dyke leaves Montgomery and Welshpool both to the left, and loses itself for a while in the wide north Severn plain. Then it climbs, in one of its most exciting stretches, sheer over the crags of Llanymynech Hill and through the high woods of Llanforda. The best walking is now past, for after Chirk Castle and the Vale of Llangollen it approaches Wrexham and is almost entirely smothered in industrial undertakings until it reappears to the north-west again, at Brymbo, heading for the sea 20 miles away at Prestatyn.

In so short an article it is impossible to give any idea of the excitement of such a walk, where your feet are on turf almost all the time, treading on ancient handiwork that is now slowly vanishing with the depredations of the rabbits, the rains and winds and the ploughman, though he fortunately has now been warned off! But I can remember few greater thrills than discovering the Dyke again after having lost it for several miles, in the shape of a smooth rounded whaleback ahead of me on the hillside, recognisable only by the faint shadow cast by a low-lying Sun. Give yourselves 10 days at least for the walk, a fortnight if you can find the time, and go and rout out Offa's Dyke this spring or summer. Go alone, or with one good friend, not in a large party, for then you will find farmers and cottagers willing to offer the occasional meal or bed. Much of your route will lie on farmland and through woods and along high cliff edges; there is more variety than you might expect to find in walking the Welsh Marches.



The southern end of the Dyke at Offa's Tump, near Chepstow.



The Heinkel 162 "Volksjaeger" jet-propelled fighter. Photograph "The Aeroplane" Copyright.

German Warplane Development 1944-1945

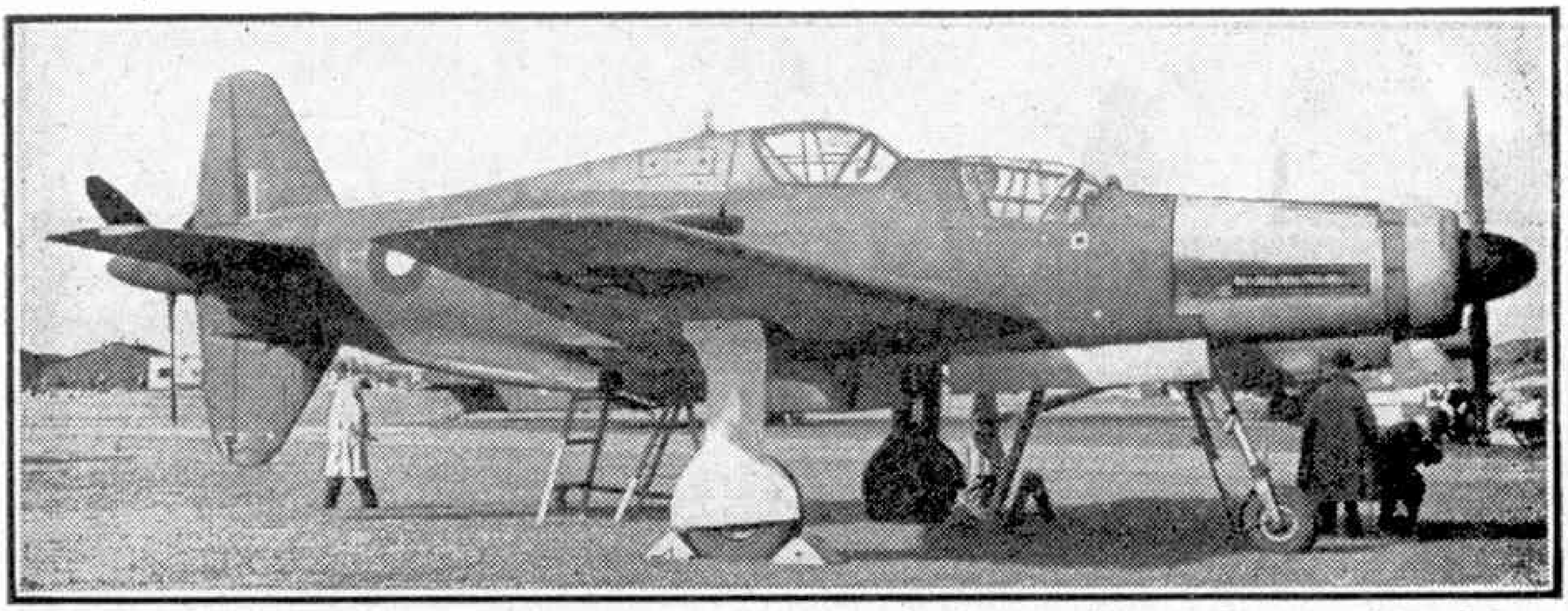
By John W. R. Taylor

NOW that Allied technical experts have had time to make a detailed survey of German war industry some amazing facts are being brought to light. For instance, it is now known that, far from being stretched to the limit, the German aircraft industry was working only one shift each day, with hardly any women workers, until after the failure of the plan to capture Moscow. And although Allied bombing of factories at first cut down production, the enemy were actually building more aeroplanes at the end of one period of intensive bombing than at the beginning. This was due largely to extensive dispersal schemes, the use of underground factories and the changeover to new types designed for ease of production and constructed from non-priority materials.

As the British and American bombing of Germany mounted in intensity the Germans were forced to concentrate more and more on defensive fighters. Consequently few bombers were in production in the closing months of the war, with the exception of some very fast fighter-bombers that could get away with tip-and-run raids without even local air superiority. Practically the whole of the enemy's offensive hopes were vested in the series of reprisal weapons, of which, fortunately, only V1 and V2 were ready in time for use against England.

From the start it was obvious that for interception and short-range bombing duties, reaction propulsion had many advantages to offer over piston-engines, and production was concentrated on machines fitted with jet and rocket motors. The first of these aircraft to go into service in any numbers was the Messerschmitt 262 twin-jet fighter, which was used with some success during von Runstedt's counter-offensive in January 1945 and against Allied forward airfields on the continent. The top speed of 527 m.p.h. enabled it to outstrip the fighters of the Second Tactical Air Force, and had there been more Me.262s in action they might have established some sort of air supremacy over forward areas. The lack of numbers resulted from an order from Hitler that the Me.262 should be converted into a fighter-bomber, which put back production by six months.

The Me.262 is a fairly orthodox jet-fighter, pleasant to fly and with a good all-round performance. But in 1944 things had become so desperate that the German Air Staff ordered several of the leading manufacturers to develop special "target defence" interceptors, of very short duration but with terrific speed and rate-of-climb. The idea was that these fighters could remain on their airfield near a factory or other vital objective until the Allied bombers came within range, then climb at fantastic speeds to intercept the bombers, attack and land all within a few minutes. The Luftwaffe did not like the idea, as such fighters would be of little use against "Mosquito" squadrons, who would spot the interceptors taking off, change course and fly away at a speed that would prevent the



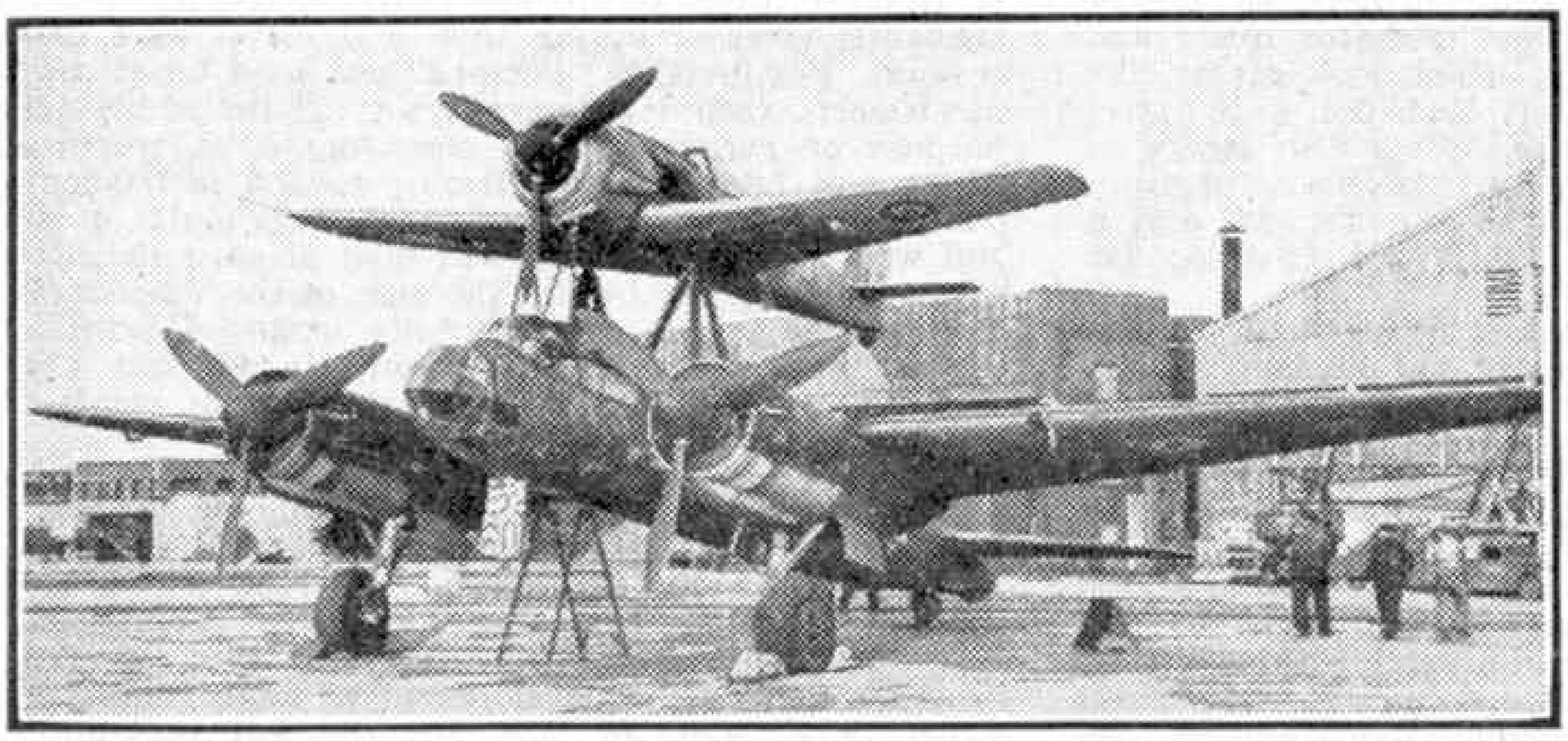
Dornier 335 fighter. This odd-looking machine has an engine at each end, and can be flown on either of them. Photograph "The Aeroplane" Copyright.

fighters catching them before their fuel ran out. Willy Messerschmitt further argued that his Me.262—a proved design—would do anything that the proposed interceptors could do. But the Air Staff wanted them, so the Air Staff got them.

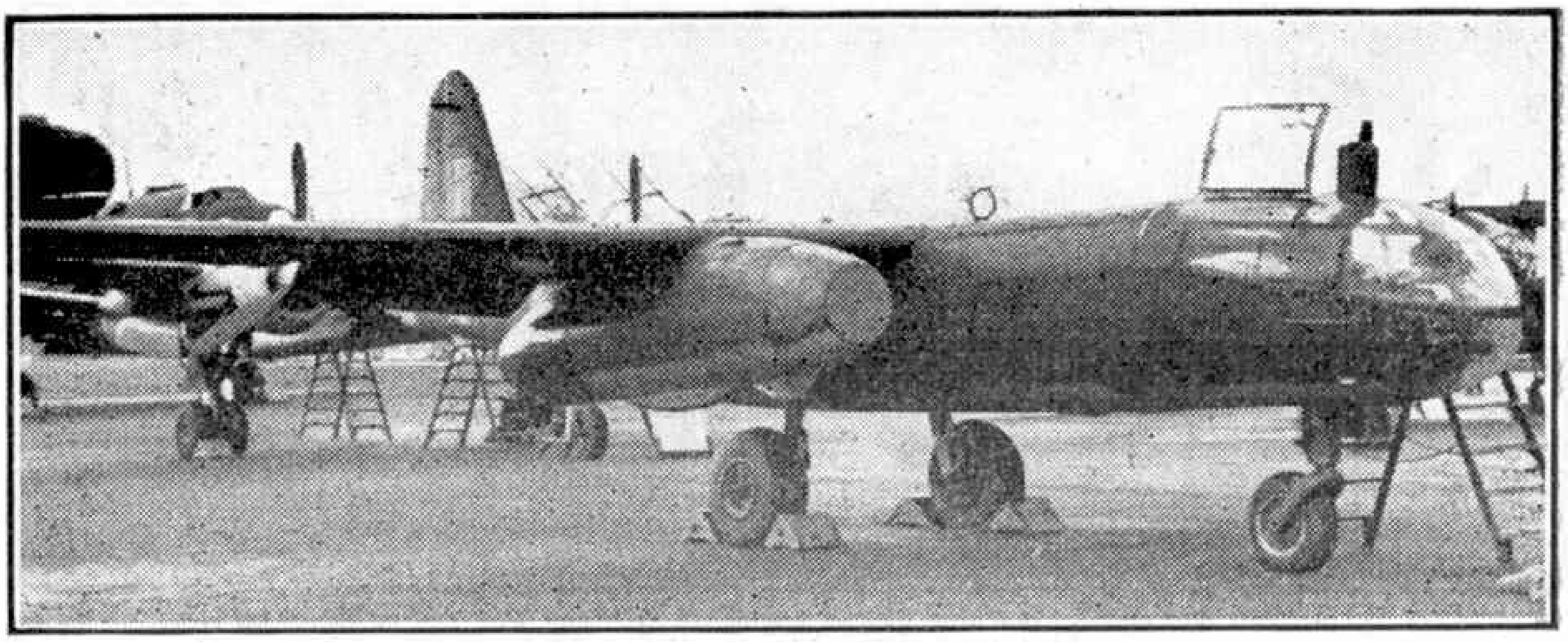
The very nature of the demands was bound to produce highly unorthodox designs. The first to go into service was the little Messerschmitt 163 tailless rocket-fighter. It has an egg-shaped fuselage, with sharply swept-back wings, only 30 ft. 6 in. in span. The cockpit, equipped with a minimum of instruments, is in the nose, and the armament consists of two 30 mm. Mk.108 cannons carried in the wing roots. 4,449 lbs. of fuel are carried for the Walter H.W.K. 309 rocket-motors, which gives the Me.163 an endurance of 4 min. at 558 m.p.h. By shutting off the motor and gliding periodically the endurance could, however, be considerably increased. Normally the Me.163 took off under its own power on two small wheels which were jettisoned as soon as it was airborne, but occasionally it was towed into the air behind another aircraft and released at height to conserve its fuel. It landed on a skid under the fuselage. It was used in action on several occasions but apparently did not prove very effective. A development of the Me.163 built by Junkers — the Ju.248 — had a Walter H.W.K. 509C motor, a "blister" cockpit and tricycle undercarriage. It was later re-designated Me.263.

An even more unorthodox target defence fighter was the little Bachem B.P.20 "Natter" (Viper) which was in effect a piloted rocket-propelled, anti-aircraft projectile with 18 ft. span wings. It was shot up vertically, complete with pilot, at a rate-of-climb of 37,000 ft. per min. When he reached the height of the bombers the pilot was supposed to aim the "Natter" at one of them, fire off a bunch of rocket projectiles carried in the nose and then bale out. As he did so the rear portion of the fuselage, containing the motor, broke off and also came down by a separate parachute, so that it could be used again.

Yet another of these interceptors, designed by Lippisch, was a triangular-shaped all-wing aircraft, rather like the paper models so beloved by all schoolboys. It had a vertical fin at the rear and was intended to be propelled at a fantastic speed—over 1000 m.p.h.,



The "Mistel" Composite bomber. Usually the lower component was a Junkers Ju.88 minus equipment and loaded with explosive in the nose, and the upper component was a standard Focke-Wulf 190 fighter. Photograph "The Aeroplane" Copyright.



Arado 234 B-2 twin-jet bomber. It can carry a 2,000 lb. bomb load. Photograph "The Aeroplane" Copyright.

—by airflow past a block of pre-heated carbon inserted into a venturi compartment in the fuselage. Take-off was by means of rockets.

Perhaps even the Germans realised that these bizarre little fighters might not work, for, as described in the November 1945 "*Air News*," they also put into production the Heinkel 162 "Volksjaeger," which was more orthodox but still comparatively easy to produce and expendable. Nor was the development of piston-engine fighters entirely abandoned, and in this class the Focke-Wulf TA.152, Blohm and Voss 155B and Dornier 335 are outstanding. But even these fighters are ugly. The TA.152 looks rather like a Focke-Wulf 190 stretched in a distorting mirror and the Do.335, with an engine at each end, looks all wrong. Nevertheless both are quite efficient, and were designed that way for a purpose.

The TA.152H is a high-altitude fighter developed from the FW.190 and powered by a 1,750 h.p. "Jumo" 213E engine, which gives it a speed of 465 m.p.h. at 30,000 ft. Although the "Jumo" is an in-line engine, it has an annular radiator in a long cowling which makes it look like a radial. The rear fuselage had to be lengthened to compensate for the longer nose, and the wing-span was increased to 48 ft. 6 in. to give improved performance at height. The cockpit is pressurised, and the armament comprises one 30 mm. cannon firing through the propeller hub and two 20 mm. cannons in the wings.

The Bv.155B is also a high-altitude fighter, fitted with a 1,800 h.p. D.B.603U turbo-supercharged engine. It has a speed of 431 m.p.h. at 55,000 ft., which is, incidentally, only about 1,000 ft. under the world's altitude record. Interesting design features include large combined radiator ducts and wheel housings in the wings, which look rather like engine nacelles in plan view, and the ¼ in. steel welded box-spar of the wings, which also serves as an integral fuel tank. The Bv.155B has a pressure cabin and similar armament to the TA.152, and a wingspan of 66 ft. 6 in. Only two have so far been built.

Although the tandem engine arrangement of the Do.335 lessens the efficiency of the engines, this is more than compensated by the reduction in frontal area, and this unorthodox aircraft has a speed of 472 m.p.h. This means that it is as fast as the de Havilland "Hornet," which is the acme of perfection in "cleanness" of design. It is a large fighter, with a weight of 23,600 lbs. and a wing span of 47 ft., but is, apparently, pleasant to fly. Most of the ones so far built have an additional cockpit aft of the usual one and were intended for use as trainers. The Do.335 has a tricycle undercarriage and can be flown on either engine. The fin and rear propeller are jettisonable if the pilot has to make an emergency exit.

The Luftwaffe had little use for bombers in the closing months of the war, and so development here was less marked. Later and improved versions of the Junkers 88—the Ju.188 and 388—were in production, the latter being a pressurised version with two B.M.W. 801 engines intended chiefly for reconnaissance duties. Various versions of the Dornier 217 were also still being built on VE-Day. But the only new bomber of real interest is the little Arado 234 B-2 twin-jet aircraft. This is fitted with a "Jumo" 004 B-4 (1,980 lb. thrust) engine under each wing and can carry a 2,000 lb. bomb load at 470 m.p.h. It is small, with a wing span of 47 ft. 4½ in., and highly manœuvrable, and would have proved quite formidable had production continued.

To use up some of their old bombers and also to economise on aircrews the Germans devised the "Mistel" composite bomber. The lower component —the "bomb"—was usually a Junkers 88, stripped of its equipment and carrying a heavy load of explosive in its nose. Mounted above this on a tubular structure was a standard piloted Focke-Wulf.190, with its undercarriage retracted. The pilot of the "Mistel" had to clamber up into the cockpit of the FW.190 and take off the whole thing, by controlling the engines of both aircraft and, of course, on the undercarriage of the Ju.88. When near the target the Ju.88 was "released" and then, theoretically, flew itself into the target. The scheme met with little success and in at least one case the Ju.88 "bomb" changed course and fell on the German lines in France. Many others were destroyed in the air while still in the slow, cumbersome composite state.

On the whole German workmanship remained good, in spite of shortage of the right materials. Many ingenious ways of saving time and metal were discovered. For instance "Perspex" was used for control handwheels, their transparency serving the additional purpose of permitting the mounting of instruction plates and labels behind them; wooden instrument panels and cockpit shelves were commonly used; and wooden skin covering was used in most unusual places, such as just behind the nose of the V2 rocket. Most of the cockpits were neatly arranged, with a car-like appearance, those of the Me.262 and 410 and the Ar.234 being outstanding both for comfort and visibility.

There is no doubt that Germany's production suffered most through bombing of her transport. In spite of this, however, it is obvious that, had the war continued, by the Summer of 1946 Allied air supremacy would have been seriously threatened. But, perhaps, largely because of the German concentration on the development of freak "end-the-war-quickly" weapons, the war did not last until 1946, and that is probably the best answer to why British designers were apparently a little behind the enemy in exploiting jet and rocket-propulsion.

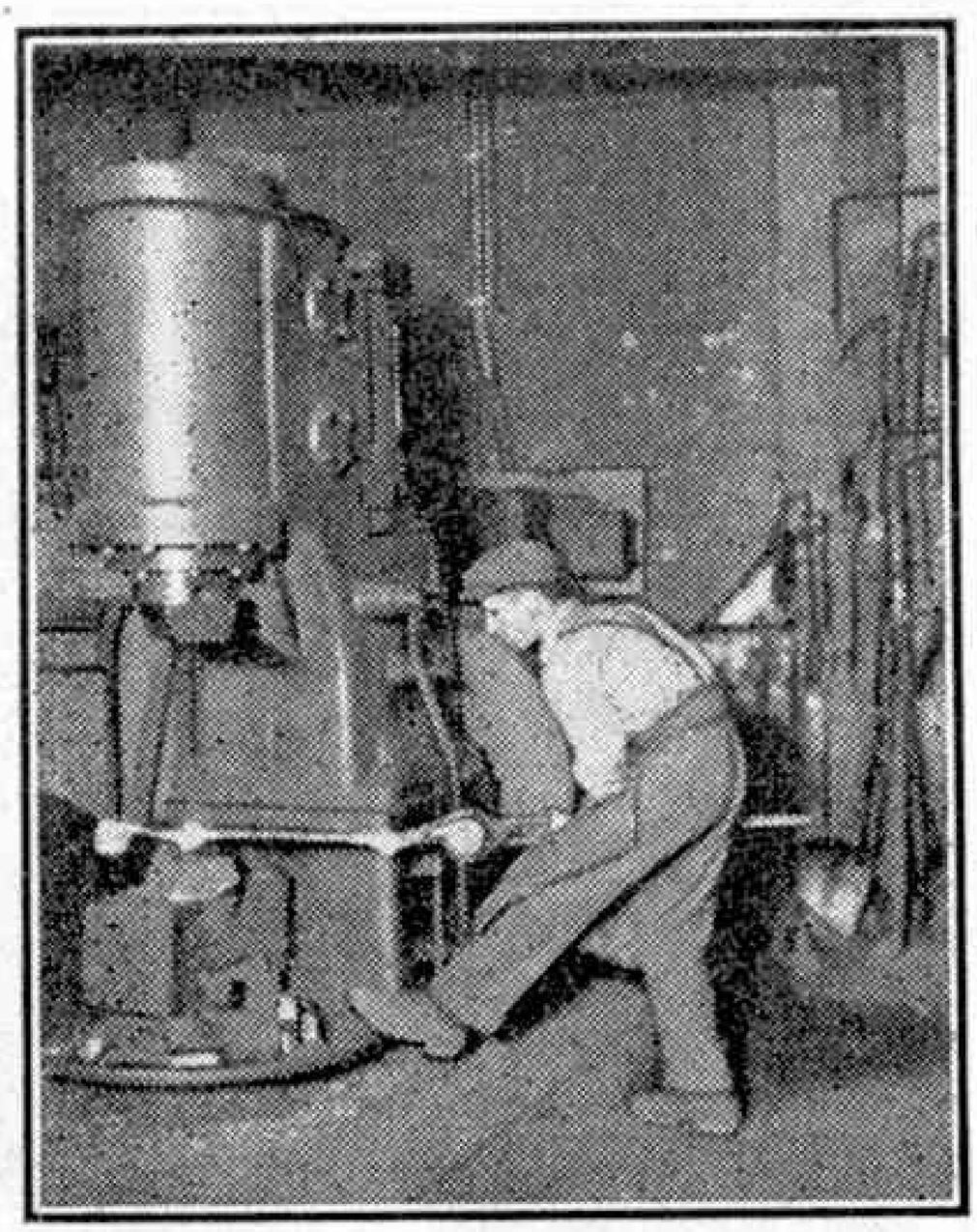
Forging by Air Hammer

THE art of shaping iron by hammering it when hot has been practised for hundreds of years. For a long time the work was carried out by means of a heavy hand hammer; later a form of power hammer known as a trip or helve was introduced. This was made in various forms, one of which consisted of a stout shaft driven by a water wheel. On the shaft was mounted a boss into which two or more massive pegs or teeth were driven. A heavy hammerhead was fixed on one end of a massive oak beam pivoted near to the opposite end, and a stout anvil was placed under the hammerhead. When the water wheel was set in motion the pegs or teeth struck in succession the end of the beam, thus depressing it and causing the hammerhead to be lifted. As the pegs continued their revolution the end of the beam was released allowing the hammerhead to fall by its own weight on to the anvil.

Hammers of this kind continued in use for many years, but the development of engineering created a need for much more powerful hammers. The eventual outcome was the steam-operated hammer, invented by James Nasmyth.

Nasmyth's first hammer consisted of a massive anvil on which the work was placed, a great block of iron forming the hammer, and an inverted steam cylinder, to the piston rod of which the hammerblock was attached. In operation steam was admitted to the cylinder on the underside of the piston, thus raising the hammerblock. By means of a slide valve the steam was then allowed to escape, so permitting the block to descend by its own weight. The speed of the blows depended upon the rapidity with which steam was permitted to enter and escape from the cylinder. In modern hammers the steam is used expansively on both the up and the down stroke, and perfect control of the blows is obtained by hand-worked expansion gear.

A more recent development is the pneumatic hammer, in which steam is replaced by compressed air. A modern pneumatic hammer is shown on the cover of this issue, and a further example appears on this page. Both of them are products of B. and S. Massey Ltd., Manchester. These hammers are made in several different sizes, and are capable of striking either definite single blows, or a series of blows in rapid succession automatically. The compressed air for operating the hammer is produced by a self-contained compressor housed in the standard and driven by an exterior electric motor through vee rope drive. The compressor cylinder with its valve gear is self-contained and forms the rear part of the standard; its piston is connected to a forged steel crankshaft that runs in bearings machined in the base section of the standard. In the larger sizes the crankshaft is driven through steel gearing running in an oil bath, from a high-speed shaft mounted in roller bearings and carrying the flywheel.



A Massey "Clear Space" pneumatic hammer at work. Photograph by courtesy of B. and S. Massey Ltd., Openshaw, Manchester.

The valve chest inlet valves are arranged to draw air from inside the hollow standard, thus ensuring that the air is clean and oily. This is very important in view of the conditions existing in most smithies. The working parts of the valve gear also are enclosed inside the standard, which forms an expansion chamber into which any exhaust air from the cylinder passes and so acts as a silencer.

The valve control lever mechanism is arranged to allow absolute control of the ram at all times, and permits both light and heavy blows to be struck, either singly or in quick succession.

"The Olympian"

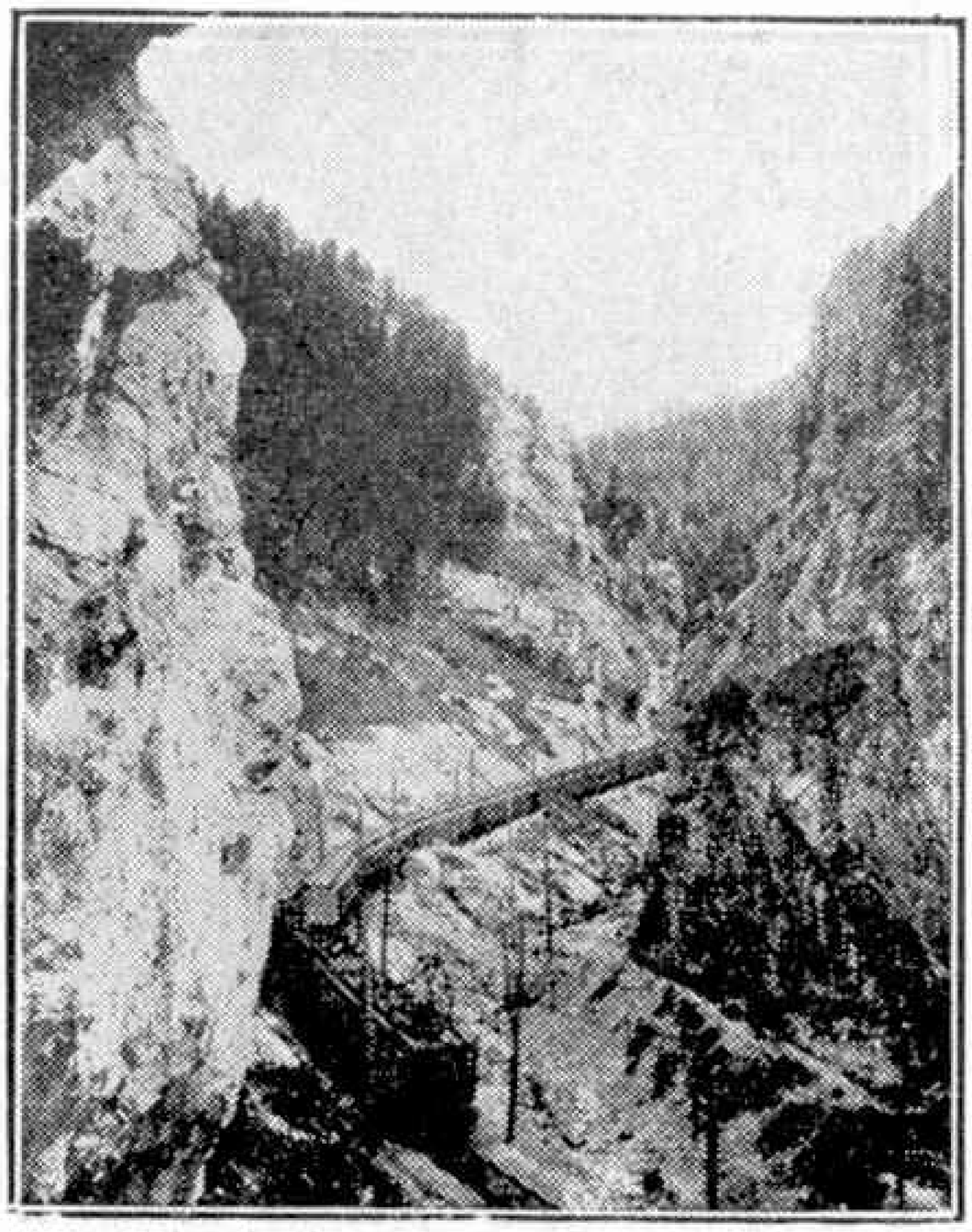
A Train that Crosses a Continent

ONE of the most famous named trains in the world is "*The Olympian*" of the Chicago, Milwaukee, St. Paul and Pacific Railroad. This line, known generally as the Milwaukee Road, spans the prairies and mountains of the United States between Chicago, on the Great Lakes, and Seattle and Tacoma on the Pacific Coast, a distance of 2,200 miles. The train itself is luxuriously appointed, with air conditioning, which keeps the coaches clean and at the proper temperature. There are sleeping cars, dining cars and club cars, with comfortable chairs and well-placed lights, while radio, magazines and newspapers are provided, and for those who are crossing the continent on business there are desks at which they can carry on with their work while travelling. A shower bath, hairdressing facilities and a valet service also are provided. Indeed almost everything that one could wish for on a journey is there on the train, and there is the marvellous scenery of the prairies and the mountains to be watched from its windows.

On its journey in the prairie region the train is hauled by steam locomotives fitted with roller bearings, but in the mountain sections these are replaced by giant electric locomotives. Countless rushing streams tumbling down rocky inclines are to be seen from the train as "*The Olympian*" glides through the Rockies, Cascades and other ranges across which the line is carried, and it is these streams that supply the power that moves the train. There are 22 sub-stations scattered along the main line, at which alternating current generated by the main hydro-electric stations is converted to direct current of 3,000 V., which is supplied to the trolley wires above the track, and thence through pantographs to the motors of the locomotives. Each of these is equipped with 12 motors, capable of developing 3,200 h.p. continuously.

The starting point of "*The Olympian*" is Chicago, which has been described as the railroad capital of the world, for 38 main line railways have their termini there. The route passes first through farmlands along the shore of Lake Michigan to Milwaukee, a city of nearly 600,000 people, from which it turns inland to St. Paul, the third city in the full title of the Milwaukee Road. Long before reaching St. Paul the Mississippi River has come into view, and this great waterway is crossed by "*The Olympian*" as it runs on to Minneapolis and plunges further westward to enter the great buffalo country of olden days, where less than a century ago the Sioux and other Indian warriors roamed, watching with alarm the approach of the pioneers of the white race. The most outstanding Indian chief of the region during last century was Sitting Bull, who made countless efforts to hold up the forward sweep of the white man, and on one notable occasion overwhelmed and massacred a band of American troopers under General Custer. The chief finally met his death at the hands of the Indian police.

"*The Olympian*" sweeps on across the prairies to the Missouri and into Montana, the third largest of the American States. Now the mountains loom up before it, and it climbs steadily through rugged country until the powerful electric locomotive now at work has lifted it to a height of 5,799 ft., or more than a mile above sea level. This is the summit level of the railway through the Big Belt mountains, the first of the ranges to be crossed before the Pacific shore is reached. Then the train plunges into Montana Canyon, where gigantic rock walls towering heavenward seem to dwarf the train. Wind, rain, snow and frost have carved the rocks of the canyon into fantastic shapes; evergreen trees grow along its sides, in spite of the seemingly precarious foothold; and the clear trout-filled waters of a stream sparkle westward through it.



"The Olympian" in Montana Canyon, in the Rocky Mountains. This train runs daily between Chicago and the Pacific North West, and its run takes it across the prairies and across four mountain ranges. Photograph by courtesy of the Chicago, Milwaukee, St. Paul and Pacific Railroad.

Montana Canyon is the prelude to more climbing, for there are still the mighty Rockies themselves to be pierced. These come into view, jagged peaks capped with snow, soon after emerging from the Canyon. The train follows the north bank of the Missouri River, and about two miles east of the junction of the three rivers that gives rise to that mighty stream is the station Three Forks, a reminder of the discovery of this historic spot in 1805. To the south is the green Gallatin Valley, at the upper end of which is the Gallatin Gateway to Yellowstone National Park, the home of the famous geyser Old Faithful and one of the great playgrounds of the United States.

Great mountain ranges are to be seen on all sides and soon the actual climb over the Rockies begins. Memories of the Wild West days are aroused by the crossing of the Vigilante Trail, named after the men who enforced law and order in pioneer days. Then the road bed is cut into a rocky mountain side, and the train plunges into Pipestone Tunnel, which marks the highest point of the crossing. Just east of the Tunnel is a sign marking the Continental Divide, 6,347 ft. above sea level.

There are other difficult mountain ranges to be overcome before the final descent to sea level on the Pacific Coast. (*Continued on page 84*)

BOOKS TO READ

Here we review books of interest and of use to readers of the "M.M." With the exception of those issued by the Scientific and Children's Book Clubs, which are available only to members, and certain others that will be indicated, these should be ordered through a bookseller. We can supply copies to readers who are unable to place orders in this manner. Order from Book Department, Meccano Ltd., Binns Road, Liverpool 13, adding 6d. for postage.

"AIRCRAFT OF THE FIGHTING POWERS," VOL. VI

Edited by D. A. Russell, M.I.Mech.E.
(The Harborough Publishing Co. Ltd. £1/11/6 net)

A good deal has now been revealed about new types of aircraft which were in service during the closing stages of the war. Many of these new machines are described and illustrated in this latest volume of the "*Aircraft of the Fighting Powers*" series. When the seventh and final volume is issued, at the end of this year, the series will provide a complete record of all the aircraft used by the Fighting Powers in the Second World War.

The present, or sixth, volume covers 1945 and deals with 72 types of operational aircraft. It is on the same lines as the earlier volumes, with interesting notes on the history and development of each machine and in some instances brief details of its outstanding achievements in the war, and of course a detailed specification of the machine. In addition there are excellent half-tone photographs and fine 3-view scale drawings of each machine that make the book valuable to the model aircraft constructor.

The British section deals with 26 aircraft, and among the completely new types included are the Gloster "Meteor" III, Hawker "Tempest" V, Westland "Welkin," and Short "Shetland." New Marks of older types of Service aircraft described in detail include the Vickers "Warwick" III Transport, the D.H. "Mosquitoes" XVI and XVIII, and the Vickers-Armstrongs "Spitfires" XIV and XVI. In the American section there are 10 newcomers, one of special interest being the Bell "Airacomet" fighter-trainer, the first U.S. jet-propelled aircraft. Other types included are the Northrop "Black Widow" night fighter, the Boeing "Superfortress" heavy bomber and the "Stratocruiser" transport version of this great machine. The 15 types of Japanese aircraft dealt with represent nearly all the new types which Japan had in service at the time of the final collapse in August last. Machines of special interest in the German section are the strange-looking Messerschmitt Me.163B rocket-propelled fighter and the Me.262 twin-engined jet-propelled interceptor-fighter.

An interesting special feature of this volume is a lavishly illustrated history of Air-Sea Rescue during the war. There is the usual valuable summary of the varied international markings and regulation colour schemes used on the military aircraft of different countries.

The book is published by The Harborough Publishing Co. Ltd., The Aerodrome, Billington Road, Stanbridge, Nr. Leighton Buzzard, Beds, price 32/6 post free.

"GADGET CITY"

By I. O. Evans (Warne. 2/6 net)

Mr. Evans has produced something of a novelty in boys' story books of the historical kind. His hero is Morgan, an ancient Briton, and the characters seem far more real than those of most stories, for instead of using stilted and old fashioned ways of expression, which are sometimes thought to give realism to stories of former days, they talk in terms similar to those in use to-day. This modern outlook pervades the whole book. For instance, in the very first chapter we read of Morgan and his companions defending the strongpoints of their own defence lines against the Romans, who laid down a catapult barrage, and discussing among themselves rumours of a secret weapon the Romans intended to put into operation. The secret weapon in this case is the elephant, which wins in an antique form of blitzkreig, with the result that Morgan finds himself a Roman prisoner.

As a slave Morgan is taken to Alexandria, the great Greek city of the Eastern Mediterranean. There he has the good fortune to be purchased by a high official of the Museum, concerned particularly with scientific and mechanical devices. There he becomes familiar with many fantastic and exciting inventions, including even a steam engine, a trial of which in a ship leads to disaster because the military demand too much of the boilers, which retaliate by exploding.

There is excitement and adventure too before Morgan becomes a qualified navigator and returns to Britain.

Throughout there is real interest in the very real people who figure in it, and every boy will revel in the story. It is illustrated by 18 drawings and a map of ancient Alexandria.

Owing to difficulties due to the war, it is impossible to guarantee prompt delivery of books ordered as described above.
Every effort, however, will be made to ensure speedy despatch.

"TIN-CAN CRAFT"

By W. A. Bagley
(The Featherstone Press Ltd. 2/- net)

Here is an interesting little book that should appeal to the fellow who likes making things. Packed into its 64 pages are descriptions and excellent illustrations of over 50 different models and gadgets, including a working model steamboat, amusing scientific gadgets, and material for conjuring tricks.

Tin cans, or material obtained from them, form the backbone of all the models described, most of which can be made with no more elaborate tools than an old pair of scissors, a nail punch and a hammer. In these days of shortage this novel book will be very valuable to the amateur craftsman.

"HURRICANE"

By F. H. M. Lloyd
(The Harborough Publishing Co. Ltd. 7/6 net)

Long before the end of the recent war the Hawker "Hurricane" had become one of the world's most famous aircraft. Its achievements during that war provide material for many books, and it is appropriate that the first full account of the great part played by this fine machine during the war comes from the pen of a member of the staff of Mr. Sydney Camm, Hawker's Chief Designer and the creator of the "Hurricane."

The author literally takes us behind the scenes in his account of how the "Hurricane" came to be designed and the developments that culminated in the completion of the first machine in November 1935. Much of the book is devoted to the "Hurricane's" achievements and adventures on the many different fronts during the war.

The book is illustrated by 80 fine half-tone reproductions of actual photographs. It is published by The Harborough Publishing Co. Ltd., The Aerodrome, Billington Road, Stanbridge, Nr. Leighton Buzzard, Beds., from whom it may be obtained, price 8/- post free.

Railway Notes

Centenary of the Caledonian Railway

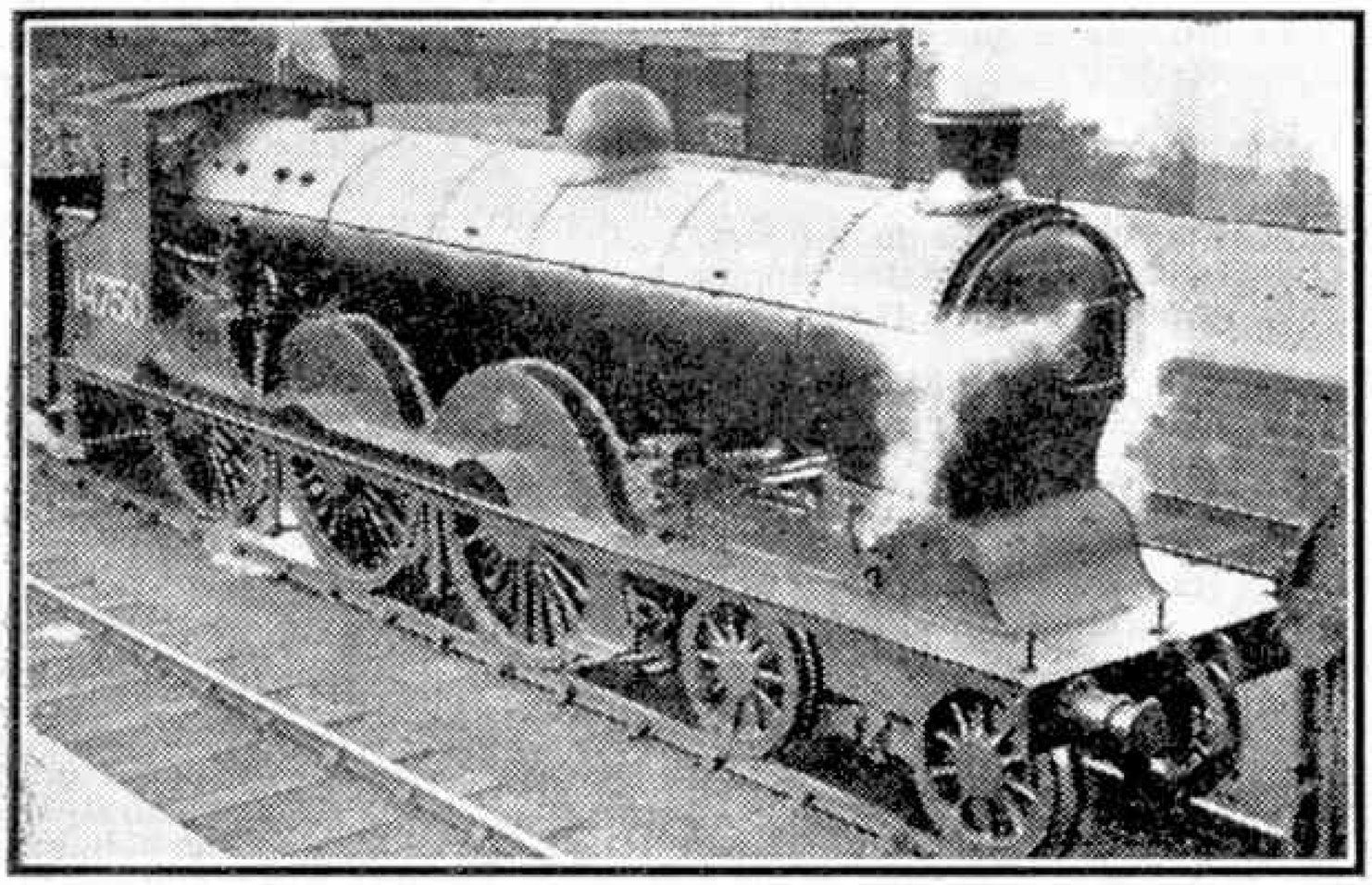
The Caledonian was incorporated just 100 years ago by Act of Parliament, to construct a railway from Carlisle to Edinburgh, Glasgow and Castlecary. It was opened for traffic in 1848 to Carstairs, and thence over separate lines to the two principal Scottish cities, incorporating the very early small line known as the Glasgow, Garnkirk and Coatbridge. Perth, Dundee and Aberdeen were reached by taking over the Scottish Central, including the Dundee and Newtyle Railway opened in 1831, and then another line called the Scottish North Eastern; so constituting, with the London and North Western Railway of England, the through West Coast route between Euston and many parts of Scotland, now part of the L.M.S. system.

The "Caley," as it was popularly known, also operated the Stirling, Callander and Oban line, famous for its scenery and steep gradients requiring small-wheeled locomotives, and it had many joint line, branch, suburban and shipping activities. It enjoyed a reputation for smartness and solidarity in its stations, buildings, permanent way and rolling stock. Passenger engines were painted blue, as were also the mixed traffic locomotives. They were beautifully lined out. Tender underframes, footplate edging, buffer beams and steps for enginemen were dark red, and the buffer beams had a bright red panel in the centre; the wheels were blue and the engine underframe was black. The smart finish was enhanced by the company's coat of arms on the tender or tank side, and on one of the splashers of the express locomotives, with large lined-out letters "C.R." and a brass number plate. Goods engines were black, embellished with red and white bands or edging.

Unusual external locomotive features included head lamps high up on the cab sides. For instance, expresses at one time carried one white light on the right and a green one on the left fixed in this manner. Discs were carried in the same positions by day. Where route indicators were used, these were at the foot of the chimney and looked like small semaphores. The deep-toned organ pipe whistle was the forerunner of that used on many L.M.S. engines to-day.

Many famous "Caley" locomotive classes familiar in comparatively recent years were designed by Mr. J. F. McIntosh, who worked his way up from cleaner to driver, locomotive foreman, and then, notwithstanding losing his right arm in an accident, to Chief Inspector. At the age of 49, in 1895, he was appointed Locomotive, Carriage and Wagon Supt., for the whole line. On retirement 19 years later in 1914 he was decorated with the Victorian Order by King George V. His neat, large boilered inside cylinder designs were outstanding in their day. The large "Dunalastair" 4–4–0s are in many cases still at work, while the 4–6–0 express class, now extinct, though not a numerous one, was renowned especially on account of the regular daily running over 30 years ago of No. 903 "*Cardean*," the most famous of the class, from Glasgow to Carlisle and back with the afternoon Euston expresses known as "The Corridor." When the L.M.S. group was formed in 1923, there were 1,070 C.R. engines, of which well over 700 still exist, 0–6–0s being the most numerous.

The notorious Beattock bank with its summit at a remote spot 1,014 ft. above sea level, on the main line from Carlisle, involves a 9¾ mile climb at about 1 in 75 by northbound trains, which are frequently assisted in the rear.



L.M.S. 4-6-0 No. 14750, shorn of its former Caledonian splendour, but still characteristic of McIntosh design. Photograph by H. C. Casserley.

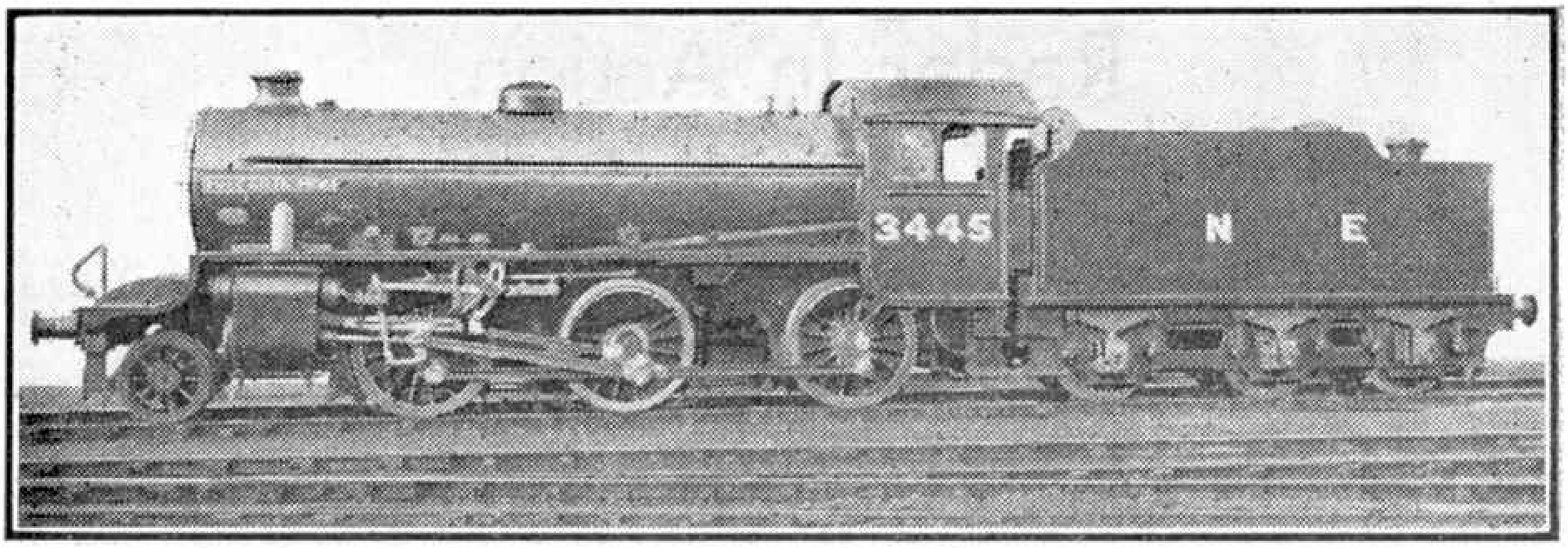
L.N.E.R. News

There are several locomotive reclassifications to chronicle. The L.M.S. "8F" type 2–8–0s owned by the L.N.E.R., including those built by the Southern and two new series now building at Darlington and Doncaster, numbered respectively 3125 and 3148 upward, are to be class "06." The "B17" or "Sandringham" 4–6–0s rebuilt with "B1" boiler and two cylinders, like No. 2871 illustrated last month, become "B2," and in consequence the G.C. "Sam Fay" 4–6–0s, hitherto "B2," change to "B19." No. 206, after modification to 2-cyl. instead of 3-cyl. 2–6–0, probably the forerunner of other similar rebuilds, changes from "K3" to "K5."

One of the smaller "K4" West Highland type of Gresley 2–6–0, No. 3445 "*Mac Cailin Mor*," has also been similarly rebuilt, and is now class "K1." This engine in its rebuilt form is illustrated. Further rebuildings from "04" G.C. type 2–8–0, to "01," with the latest standard boiler and cylinders, include Nos. 6231, 6374, 6533, 6642. "Pacifics" that are rebuilds from "P2" 2–8–2 numbered 2001–6 are now "A2/2," and the new Thompson 4–6–2s with 6 ft. 2 in. driving wheels are "A2/1," probably leaving plain "A2" for a new series with 250 lb. per sq. in. boilers and 6 ft. 2 in. drivers. Engines of this new series would thus be similar to the latest "A1" as represented by No. 4470 "*Great Northern*," illustrated in last December's issue, but with smaller driving wheels.

The 6 ft. 2 in. "V2" "Green Arrow" 2–6–2s have proved invaluable for all kinds of main line traffic during the war, such as heavy passenger, fast goods and the haulage of innumerable Services' specials over many parts of the system in England and Scotland. They have indeed been worked hard, and at present take a considerable share in handling the accelerated ordinary expresses on the East Coast, Kings Cross-Leeds, and other main routes.

By the withdrawal of No. 1639, a famous former North Eastern Railway's 7 ft. 1 in. 4–4–0 "D17/1" class becomes extinct, though it is understood, as already mentioned, that No. 1621 is to be preserved in the Railway Museum at York on account of the amazingly fast record run she made from Newcastle to Edinburgh on 21st August, 1895, the East Coast's fastest run during the race to Aberdeen. Nearly 124½ miles were covered in no more than 114 min.



L.N.E.R. No. 3445 "Mac Cailin Mor," of the "K4" class, which has been converted to two-cylinder instead of three-cylinder propulsion, with a boiler at 225 lb. per sq. in. pressure and other changes. This engine will be the first of the new class "K1." Photograph by courtesy of the L.N.E.R.

No. 9400 is the first of the North British later superheated "Scott" 4–4–0 series, now "D30," to be scrapped. More good old "Atlantics" have been withdrawn, including No. 2212, the last built of the Raven 3-cyl. N.E. class, which had been a subject of experiments with unusual valves and cylinders.

We are informed that No. 3696, the first of the "A2/1" 4–6–2s stationed at King's Cross, now has an ordinary screw reverse quadrant and Gresley twin-handled regulator, the steam reversing gear having been removed, and also an eight-wheeled tender of the "A4" non-corridor type, which balances the length of the engine rather better. No. 4470 "*Great Northern*" is now provided with smoke deflectors, as well as cab and running plate like that previously standard on the unstreamlined "Pacifics." She is equipped with electric lighting for headlamps and footplate.

No further engines leaving Works have been painted green or blue up to the time of writing.

L.M.S. Locomotive Information

New 4–6–0 class "5" mixed traffic locomotives put into traffic during the past three months were allocated as follows: No. 4900, 31A, St. Rollox; Nos. 4901–3, 4934, 12A Kingmoor (Carlisle North); No. 4904, 4935 8A Edge Hill (Liverpool); Nos. 4905–6, 4936 12B Upperby (Carlisle South); Nos. 4907–9, 4912, 4940, 5A Crewe (North), Nos. 4913–4, 3A Bescot; Nos. 4937–9, 9A Longsight (Manchester). These engines continue the 4901 series building at Crewe and the 493x batch under construction at Horwich.

Further new 2–6–4Ts class "4P" built at Derby are Nos. 2202–4, shedded at 24D, Lower Darwen, Lancs., and Nos. 2205–8, at 25B Huddersfield. An additional 350 h.p. Diesel shunter 0–6–0 No. 7124 was turned out from Derby and allocated to 5B, Crewe (South). Many of the old style "2F" 0–6–0 freight engines that had been on loan to the G.W.R. during the war years have returned to the Midland division.

Withdrawals include the last of the Caledonian "Oban" 4–6–0s, with 5 ft. 6 in. driving wheels, which were built for steep gradients in 1922, only just before grouping; this is No. 14621, class "3P." Ex-Glasgow and South Western 2–6–0 No. 17826 and 0–6–2T No. 16907 have gone; only eight of that company's locomotives remain out of 528 taken over by the L.M.S. in 1923. Others being scrapped are tender 0–8–0 No. 12958, ex-Lancashire and Yorkshire; 4–4–0 No. 14350, of the Caledonian "Dunlastair IV" superheated McIntosh class; 0–6–0s Nos. 12205, 12224 and 12546 of class "3F" L. and Y., No. 17649, from the former Caledonian; and No. 28587, London and North Western. Three more of the famous L. and Y. 2–4–2Ts withdrawn are Nos. 10822, 10843 and 10897, with several other tank engines, including one of the diminutive Highland Railway 0–4–4s, class "OP" No. 15054.

Southern Tidings

The second electric main line locomotive No. CC 2 recently worked a number of trial special trips between London (Victoria) and Brighton with a train of empty Pullman cars usually operated in steam trains, weighing nearly 400 tons. This locomotive has also been hauling main line goods trains to and from Norwood-Chichester and other Mid-Sussex stations.

L.M.S. north express from Euston near Northchurch Tunnel, headed by 4-6-2 No. 6203 "Princess Margaret Rose." Photograph by H. C. Casserley.

The name "*British India Line*" has been allocated to "Merchant Navy Pacific" No. 21C 18. Of the smaller "West Country" 4–6–2 class, Nos. 21C 106–9 are named respectively "*Bude*, "*Wadebridge*," "*Padstow*" and "*Lyme Regis*"; No. 112 is "*Launceston*." Nos. 113–6 went into service during October and November; No. 116 worked the up Continental express from Newhaven to Victoria, Central Section, on certainly two occasions in December last. This is usually an "Atlantic" duty, but engines of various types haul additional Services trains.

Radar In Action

"Blips," "Pips" and "Breaks"

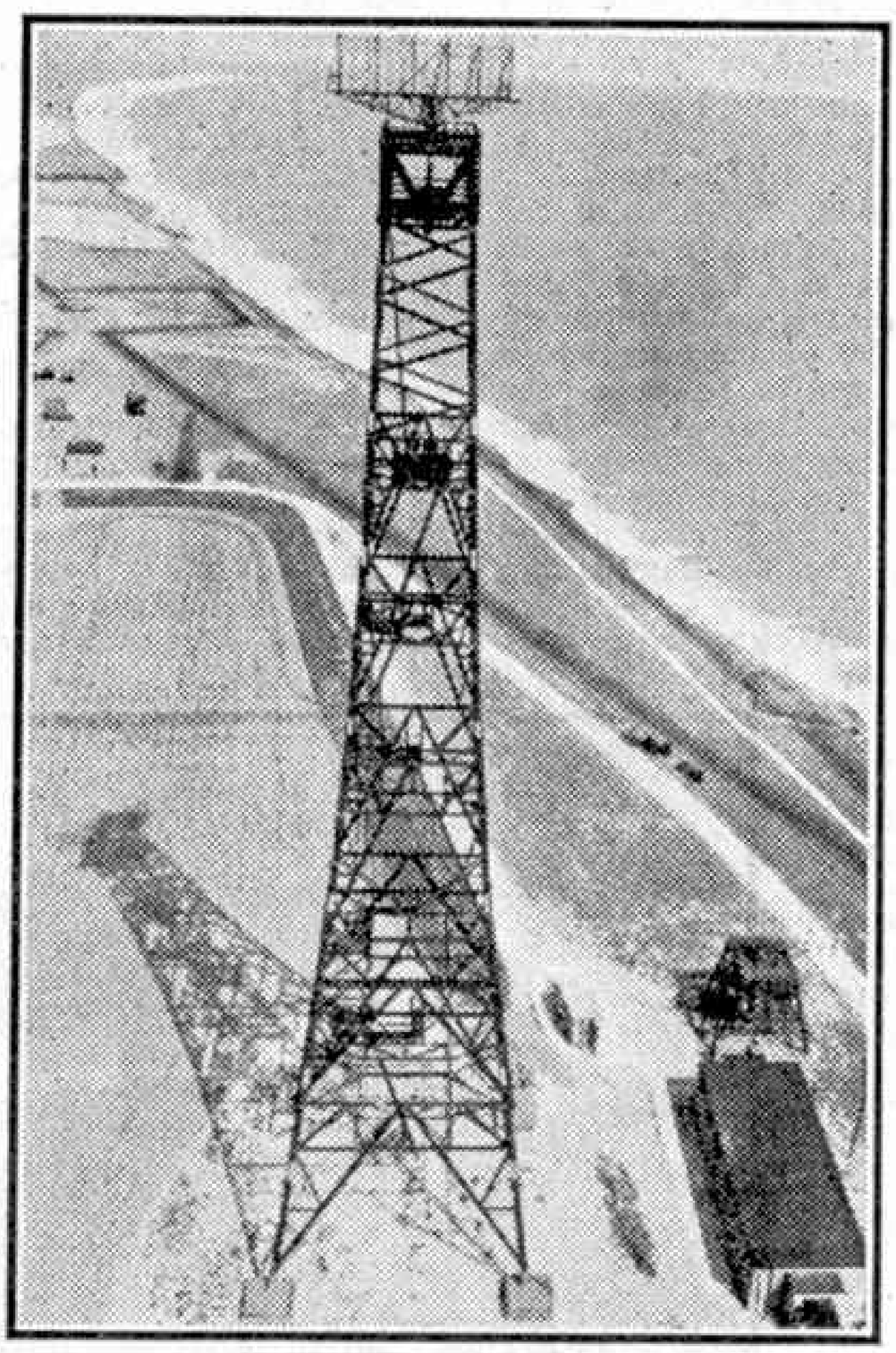
By Capt. J. H. Gardner, R.A.

A PEEP inside a radar cabin reveals a mass of knobs, switches and dials, and that main centre of attraction, the screen. The talk inside may be of "breaks," "C.R.T.s," "P.P.Is," and so on, all very mystifying.

Radar has been made in many different types, ranging from Coast stations with 350-ft. masts down to the small sets carried in fighter aircraft. But whatever their size, they all make use of the same basic principle, that of the radio "pulse." As long ago as 1886 Hertz had demonstrated that radio waves were reflected from certain objects, but no practical use appears to have been made of this discovery until 1904, when a German engineer devised apparatus for the detection of obstacles and for navigational aid at sea. Between 1922 and 1930 the Americans experimented extensively with radio detection, but did not employ the "pulse" technique that characterises radar.

Pulse ranging was first used in 1925 in connection with the measurement of the height of the ionosphere, a radio reflecting layer some miles above the Earth's surface. The application of pulse ranging to the detection of aircraft and ships appears to have occurred simultaneously in Great Britain, America, France and Germany some time in 1935.

The B.B.C. transmitters radiate a "carrier wave" on which speech and music are conveyed to your receiver. This wave is being radiated the whole time, but a radar transmitter chops up the wave, as it were, and sends out short "pulses." Objects such as aircraft and ships in the path of these pulses will reflect back a portion of the energy, most of which is dissipated in space. The echo is a very minute portion indeed, being something like one millionth of a millionth of a millionth part of the original power! But a super-sensitive receiver can detect and amplify that tiny echo sufficiently for it to produce a visual signal on the screen of a cathode ray tube.



A CHL or Chain Home Low radar station.

Now by timing the journey of the pulse and the echo, it is possible to ascertain within a few yards the distance away of the object causing the echo. This is made possible because the pulse and the echo always travel at the constant speed of 186,000 miles per second. The timing is done electrically, a wonderful achievement when you consider that the echo covers a mile in five millionths of a second.

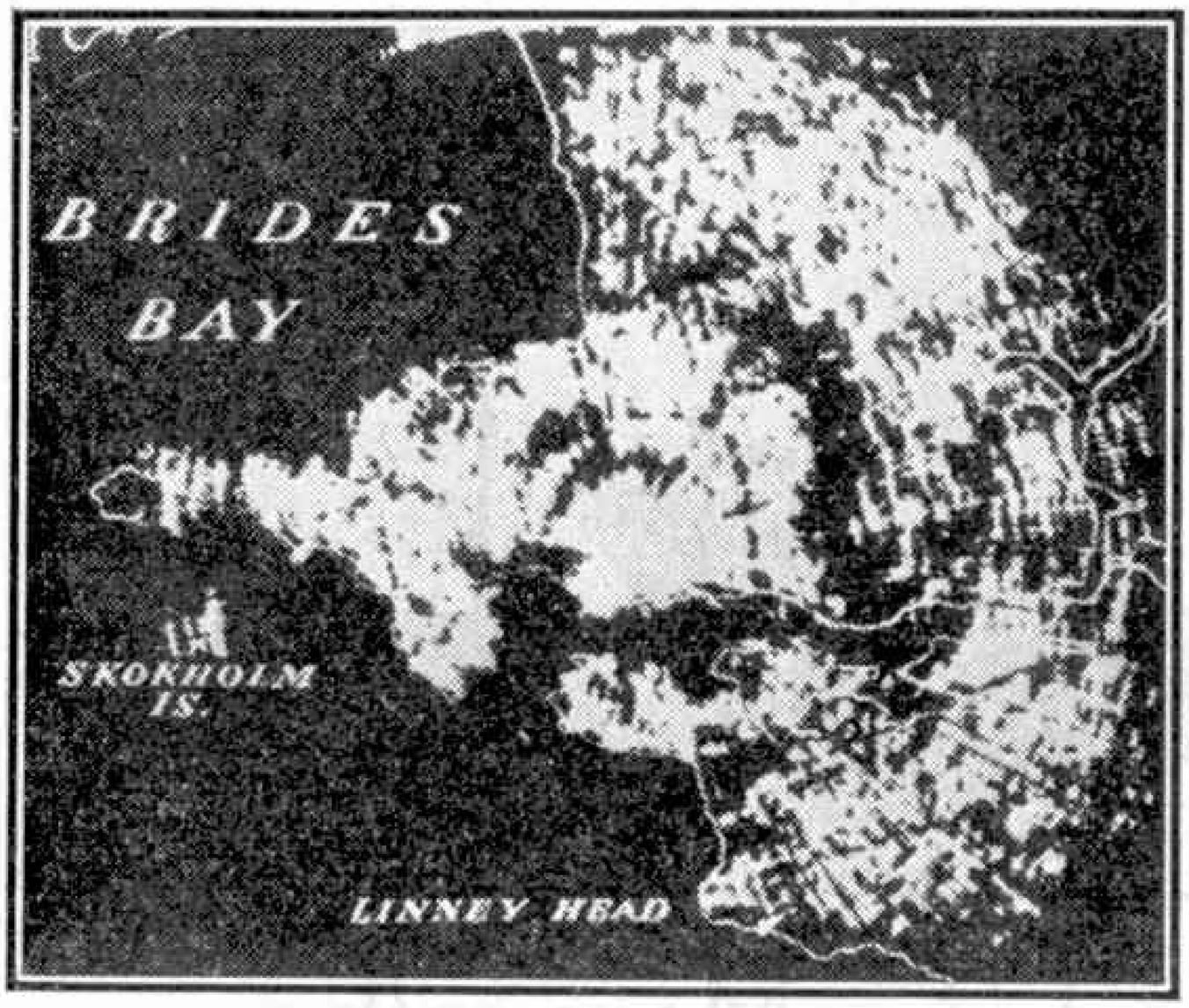
There are two usual ways of showing the echo on the screen of the cathode ray tube. In radar equipment designed for use with the guns, the echo appears as an inverted V-shaped notch in a horizontal line of light, as shown in the lower illustration on the opposite page. Ack-ack operators call this notch a "break." This method is ideal for obtaining gunnery data, as it allows very accurate readings to be taken. On the other hand, the second method, called "P.P.I." presentation, is more useful when a general "picture" of the aircraft or ships in a certain area is required. The letters mean "Plan Position Indicator," and the screen of the cathode ray tube is marked out with a plan or map of the area. The echo appears on the P.P.I. as a small sausage-shaped patch of light, showing the exact position of the aircraft or ship causing the echo. These echoes were called "blips" by English operators, while the Americans called them "pips."

Of course the echo itself did not indicate whether the aircraft or ship causing it was friendly or hostile, so a method of identification called I.F.F. was devised. These letters stand for "Identification Friend or Foe," and the equipment, carried by all our aircraft, sent a special code of signals to the radar operators. Ships identified themselves in the same way.

You no doubt have noticed what a bewildering variety of aerial systems are used in radar. Some have stumpy little aerials perched on top of high masts, some have complicated structures of rods with wire netting behind them, while others have simply a bowl-shaped arrangement on top of the cabin. All aerials transmit and receive more efficiently in one direction than another, and radar makes use of this property for direction finding. So some stations have fixed aerials with one set pointing North-South and another set East-West; others have either rotatable aerials, or fixed aerials mounted on a rotatable cabin in which the radar is housed.

The aerial system can be designed to "flood-light" a wide area, or alternatively, it can concentrate the radiation into a beam, depending on requirements. The wire netting already mentioned acts as a reflector to concentrate the radiation in a forward direction. In some aerial systems we find separate aerials used for finding range, bearing and elevation. The radars with the bowl-shaped object on the roof employ an "overlapping beam" technique for the latter purpose. Their wavelength is of the order of centimetres, and the actual aerial is only some two inches in length. It is mounted in the centre of the bowl, which acts as a reflector to concentrate the radiation into the form of a beam.

To sum up, the essential requirements of radar are a powerful transmitter to radiate "pulses," a very sensitive receiver to pick up and amplify the echoes, a cathode ray tube for a visual indicator of



The "map" on the screen of a "gen box." The white coast line and the names are the only additions to the original photograph.

the echoes, and a suitable aerial system. Some have both the transmitter and the receiver in the same cabin, others have the two instruments in separate cabins, perhaps 100 yds. apart.

Each of the three Services has developed radar to meet its own particular requirements. The R.A.F. were first users of radar, operating the stations that were erected round our coast. These stations were known as C.H., meaning "Chain Home," and C.H.L., "Chain Home Low." Commenced in 1935, a "chain" of these was in operation by September 1939, manned throughout the 24 hours by W.A.A.F. operators. During the Battle of Britain these stations flashed warnings to our waiting fighters and Ack-ack batteries. From Scapa Flow to Portsmouth they covered the approaches to this island, and thus saved our aircraft hours of needless patrol. To these operators we owe in a large measure the defeat of the Luftwaffe in the Battle of Britain.

Radar supplied the answer to the night-bombers, too. From the ground, radar stations known as G.C.I.s, initials that represent "Ground Control of Interception," guided our night-fighters to within a few miles of their quarry, whereupon the pilots could pick up the raiders on their own A.I., or airborne interception sets. Guided by a spot of light on the A.I. screen, the fighter got on the tail of the bomber preparatory to closing in for the final burst from its cannon.

A near relative of A.I., known as A.S.V., was used by Coastal Command and the Fleet Air Arm for the detection of surface vessels and surfaced U-boats. It was perfected in time to provide the deciding factor in the Battle of the Atlantic. From the A.S.V. technicians developed the famous "gen box," or "Mickey," of the R.A.F. This radar is officially termed H2S; it gives the navigator of an aircraft a picture of the landscape beneath. Water, being non-reflecting, appears black, while built-up areas give echoes varying in strength according to their nature. Consequently the H2S paints a picture in varying intensities of light and shade, enabling the navigator to find the target in spite of heavy cloud or fog.

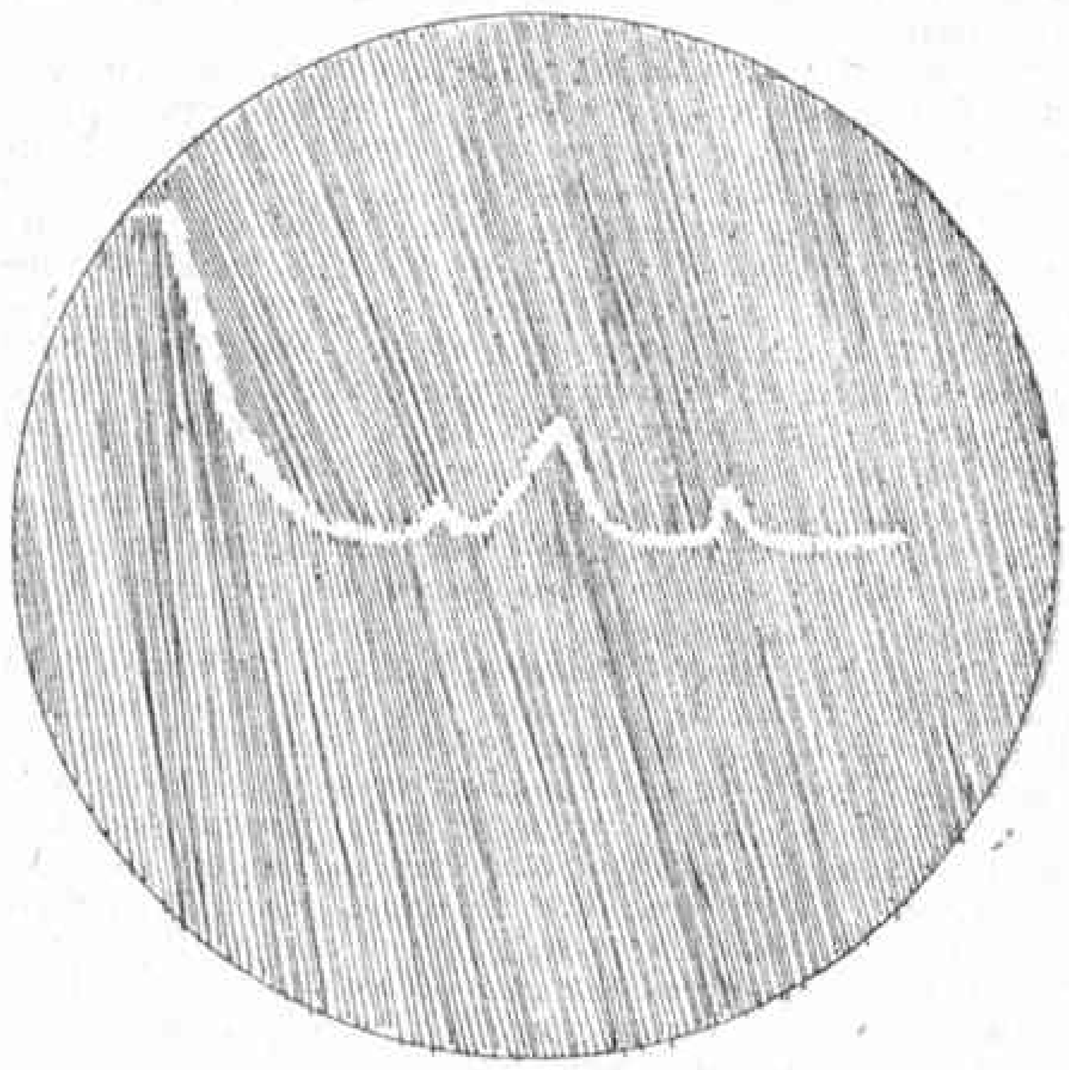
Another development of pulse technique gave Bomber Command "Gee," which made it possible to send a thousand bombers over a target in one hour. Gee enabled each one to take-off, navigate, and return without fear of collision with the multitude of others in the air. Then came "Oboe," the wonder equipment which, operated from this country, guided the Pathfinders to their targets in the Ruhr. It not only guided them, but also indicated when to drop the flares. Bombs can be released automatically by "Oboe."

Radar came to the aid of the Airborne Forces in the shape of "Rebecca-Eureka." Rebecca went down with the first paratrooper, who set it working as a beacon to guide his comrades. "Rebecca" talked to "Eureka," and thus everybody landed at the correct spot.

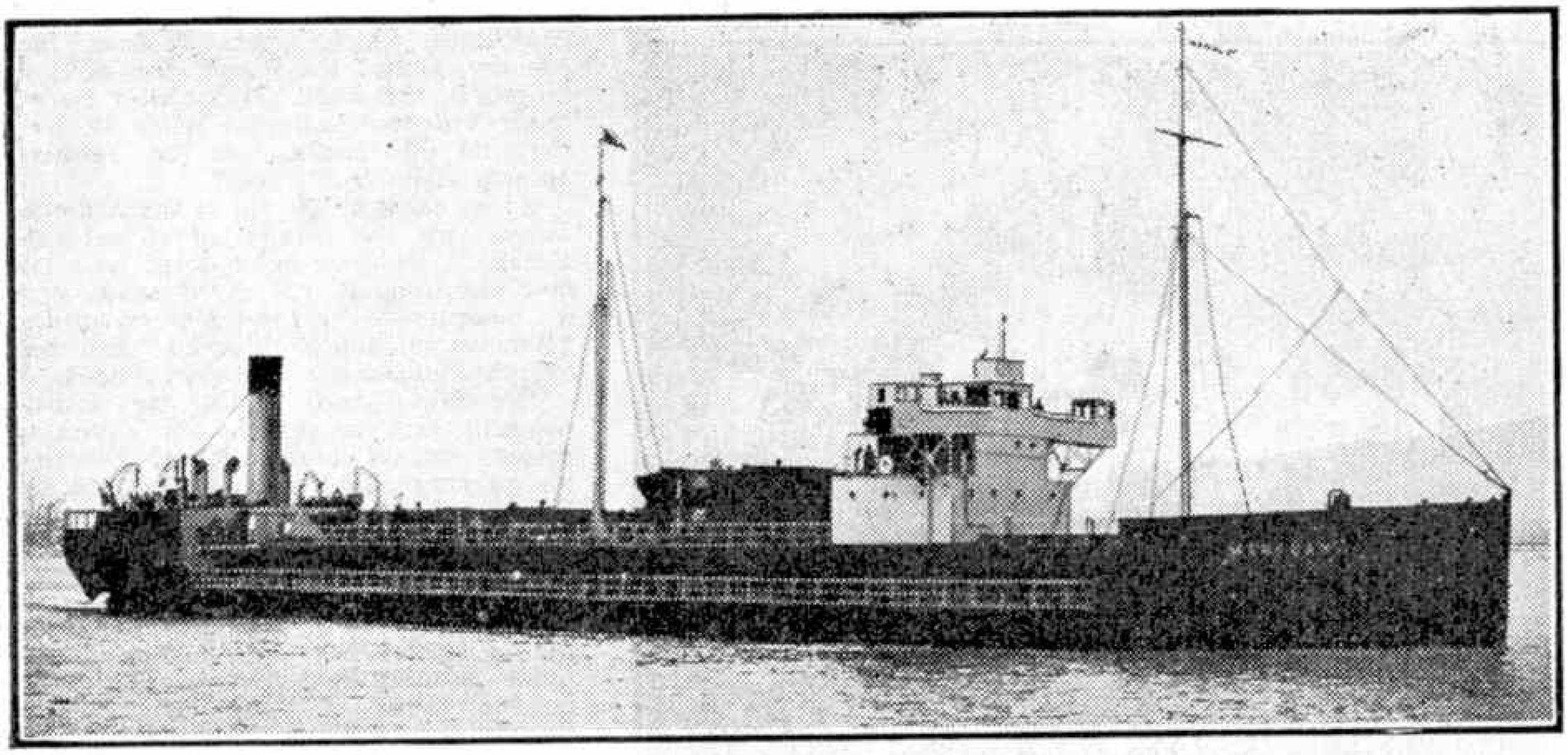
The Navy used radar for aircraft warning and detection, for detecting surface vessels and surfaced U-boats, for gunnery and for navigation. In the Battle of Matapan, the first major night action for 100 years, the "*Warspite*" scored five direct hits out of six with the first broadside of her 15 in. guns at a range of 6,000 yds. The sinking of the "*Bismarck*" by the "*Rodney*" was a radar gunnery action too. The radar on the "*Duke of York*" detected the German battle-cruiser "*Scharnhorst*," and a salvo of 14 in. shells was the first thing the Germans knew about it. Some of the Navy radar is so sensitive that it can detect dinghies, buoys, rain squalls, and even seagulls in flight.

Radar served the Army well in the Heavy Ack-ack role. In addition to providing warning of the approach of hostile aircraft, equipment was developed that measured range to within a few yards, and bearing and elevation to within a fraction of a degree. By the time the "Doodlebugs" arrived the gunners had radar that would follow the target automatically. This radar used in co-operation with remote-controlled guns represents a tremendous advance on the equipment of 1939. Light Ack-ack also used radar, but to a less extent than their heavy comrades. Searchlights were fitted with radar known as "Elsie," from the initials S.L.C., that is searchlight control. "Elsie" enabled exposures to be made right on target first time. Another use to which radar was put was the detection of hidden infantrymen, the metal in their equipment being sufficient to produce an echo.

There is little doubt that we kept well ahead of Germany in radar technique.



The "breaks" on the screen of a cathode ray tube that mark echoes.



Tankers for Lake Maracaibo

By Denis Rebbeck, M.A., M.Inst.N.A., A.M.I.Mech.E.

LAKE Maracaibo is connected to the Gulf of Venezuela by a narrow bottleneck of water. Petroleum that is produced in the lake is of no value until it has been transported to a deep-water harbour for ocean shipment. Lake Maracaibo resembles an inland sea, being fed by a large number of rivers during the rainy season. It is about 100 miles in length and is 57½ miles wide at its greatest span. Most of the large amount of petroleum produced in Venezuela is taken from below the waters on the margin of the eastern side of this lake.

The outer Maracaibo Bar which blocks the entrance to the lake has for a long time been a source of trouble to the tankers that serve the Venezuelan oilfields, and a special type of tanker was evolved for the trade. There are large fleets of special shallow-draft tankers engaged in the work and these fleets proceed line ahead, as many as 24 at a time in either direction.

These little vessels literally sneak across the bar in the limited time available at high water. They are in every sense of the word special craft, and an expert knowledge of local conditions is required for their successful production. On account of the draft restrictions imposed, about 13 ft., the tankers were designed with a large beam in relation to length; and, as too much capacity resulted, wing buoyancy tanks were fitted throughout the length of the tanks. The earlier ships were 305 ft. by 50 ft. by 15 ft., and they carried about 3,100 tons deadweight.

As a matter of interest, this shallow draft design was very obviously suitable for conversion to tank-landing ships, and certain vessels of the fleet were altered for this purpose.

The steam tanker "*Maracay*" is the 21st tanker of this type built by Harland & Wolff Limited, at Belfast, for this particular service. She is, however, slightly larger than the previous vessels, being 350 ft. long by 60 ft. beam, by 17 ft. 6 in. depth moulded, with a tonnage of 3,840. The ship is classed 100 A1. at Lloyds, being specially designed for the carriage of petroleum in bulk. In general arrangement the "*Maracay*" resembles the previous ships of the fleet, having her engines aft and her bridge slightly forward of amidships. The two propellers are driven by double expansion steam engines which develop a total of 1,800 indicated horse-power, steam being supplied by two single-ended boilers burning oil-fuel under forced draught at a working pressure of 180 lb. per square inch.

The hull is divided by 10 watertight and oiltight bulkheads; there are seven compartments for cargo oil, the fore and aft peak tanks being arranged for water ballast. Deck officers are accommodated in the bridge house amidships, while the engineers and other members of the crew have their quarters aft. It might be mentioned that the deck and engineer officers are usually European, while the crews are composed of men from the local islands, and the stewards and cooks are Chinese.

During recent years dredging operations have been undertaken so as to increase the depth of water over the outer Maracaibo Bar, because the main channel over the bar did not remain at constant depth. It was noticed that the channel moved from east to west over a distance of several miles, gradually decreasing in depth until it could no longer scour itself adequately, whereupon it switched back to the eastern position and the process began all over again. The cycle takes about 25 to 30 years and as a change took place between 1912 and 1915, it appeared that by 1935 a serious situation might arise at any time.

The matter was therefore investigated, and in order to determine the best means of controlling, or assisting, nature to form an improved channel, a model of the area was constructed to reproduce the shifting sands and the tides. This is, perhaps, the only way in which the effect of the variations produced by engineering works on the formation of estuaries can be studied, and it has been found that very accurate results may be obtained.

As a result of the experiments it was decided to lend nature a helping hand by opening up a new channel about two miles to the east of the old one, and operations were begun in 1938, one of the older tankers, the s.s. "*Invercaibo*," being converted into a dredger. As a result of this dredging, the average allowed draft of vessels crossing the bar at high water is now almost 19 ft., and all the lake tankers, with the exception of the s.s. "*Andino*," the largest ship in the service, can now cross the bar with full cargoes at all states of the tide. The "*Andino*," which carries 6,100 tons deadweight, can go out of the lake fully laden at high water, and it is therefore apparent that the size of the tankers engaged on this service will increase in the future.

Some Notes on Driving

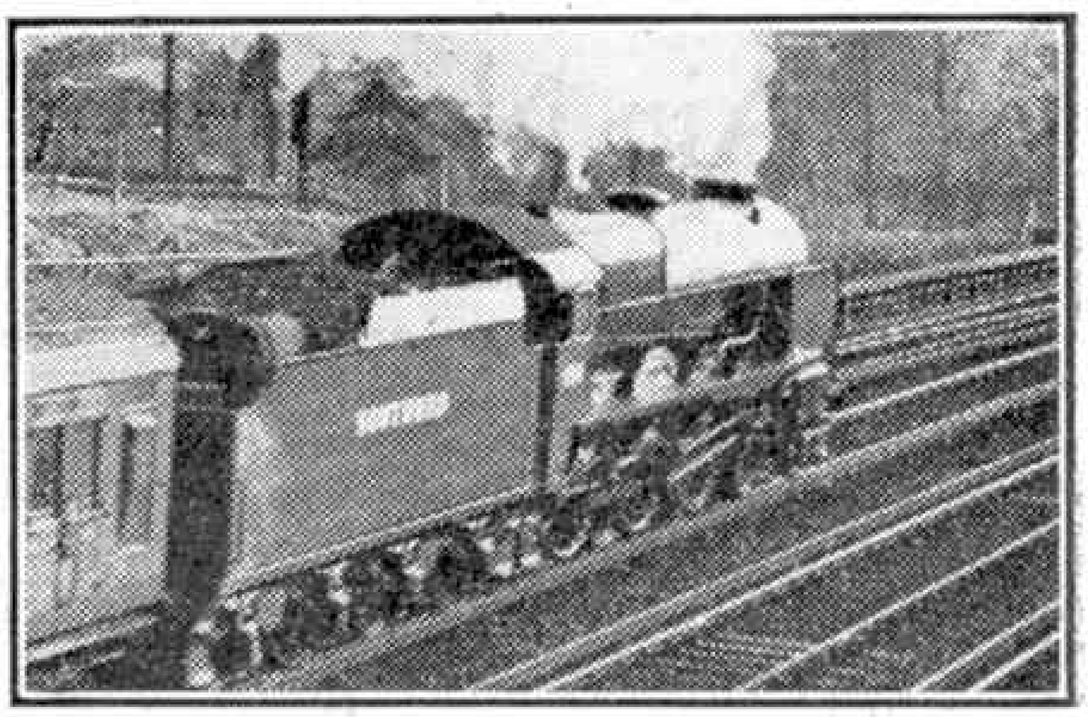
By "Shed Superintendent"

LET me commence by explaining the meaning of "cut-off," a word which often occurs in writing about the locomotive. It must be understood that live steam is not passing into the cylinder during the whole of the stroke of the piston. Steam is passed into the cylinder for a portion of the stroke, and it is then cut off by the valve which controls its admission. When starting, steam is admitted for 85 per cent. of the stroke, and the cut-off is therefore 85 per cent. When running, steam may only be admitted for 15 per cent. or 20 per cent. of the stroke, and the cut-off is 15 or 20 per cent. accordingly.

The cut-off is varied by the reversing gear control wheel or lever, attached to which is a scale showing the positions of the gear from full forward gear down to mid gear (or neutral) and from mid gear to full backward gear.

Descriptions of locomotive test runs are accompanied by notes of the cut-off used over each stretch of the route, and such figures tell one just how hard an engine is being worked to produce the results achieved. Obviously, everything depends on the steaming capacity of the boiler, and there are few engines which could stand being worked at high speed at over 35 per cent. cut-off for any length of time without overtaxing the boiler, assuming the regulator to be fully open.

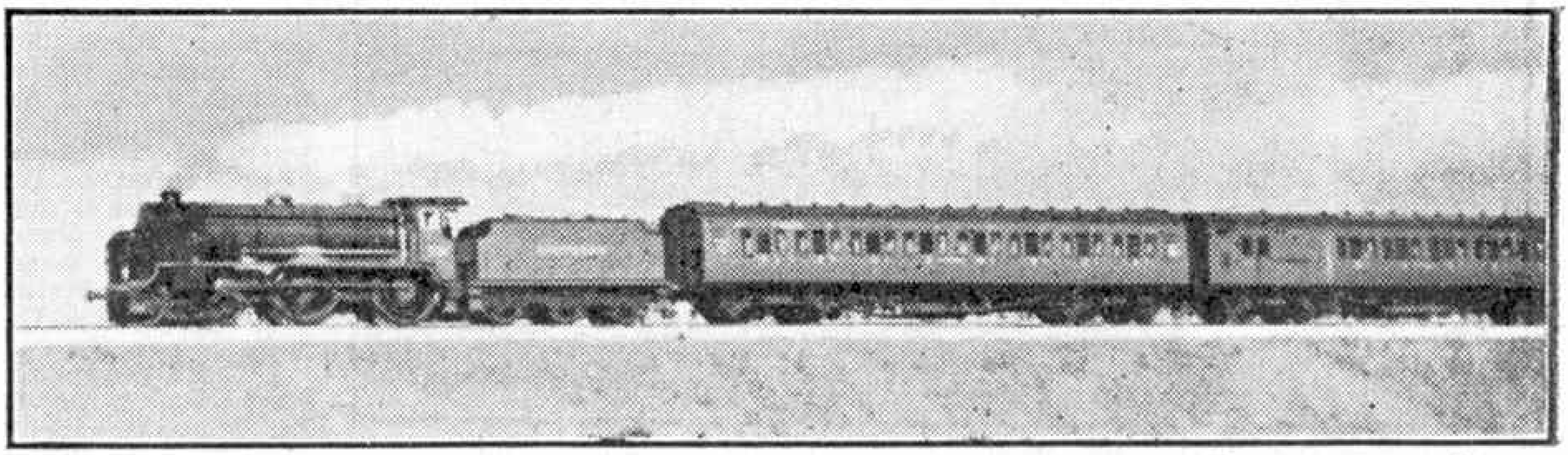
An average 4–6–0 engine with 14 coaches on a fairly level road will maintain 75 m.p.h. easily with an 18 per cent. cut-off, and in so doing will use about 55 lb. of coal per mile and about 45 gallons of water per mile. Thus a tender of water will be enough for a 100-mile trip. But if the engine is thrashed and there are no water-troughs to provide replenishment, a special stop may have to be made for water, and any time gained by working the engine hard will be lost by stopping for water.



S.R. "Lord Nelson" class No. 864 accelerating after speed check. 40 m.p.h. Regulator full open and 30 per cent. cut-off.

Comparisons between one engine and another, or engines of different types, should certainly not be made from the figures of cut off readings and regulator settings, as there are dozens of factors which affect performance, such as the weather, the quality of the coal, and the condition of the piston rings in the engine, which may not be as steamtight as new piston rings.

In wet weather, and especially in the Autumn when the leaves fall on the rails, an engine may be very prone to slip. When, therefore, the load limit for a class of engine is laid down, it is with a view to the worst conditions which may be met in everyday working, and by no means represents what the engine could do in favourable circumstances, and in newly-repaired condition. The abilities of a particular class should be judged on regular, not occasional, performances.



S.R. "Schools" class No. 928 running at 70 m.p.h. with regulator ¼-open and 15 per cent. cut-off.

Air News

More New British Aircraft

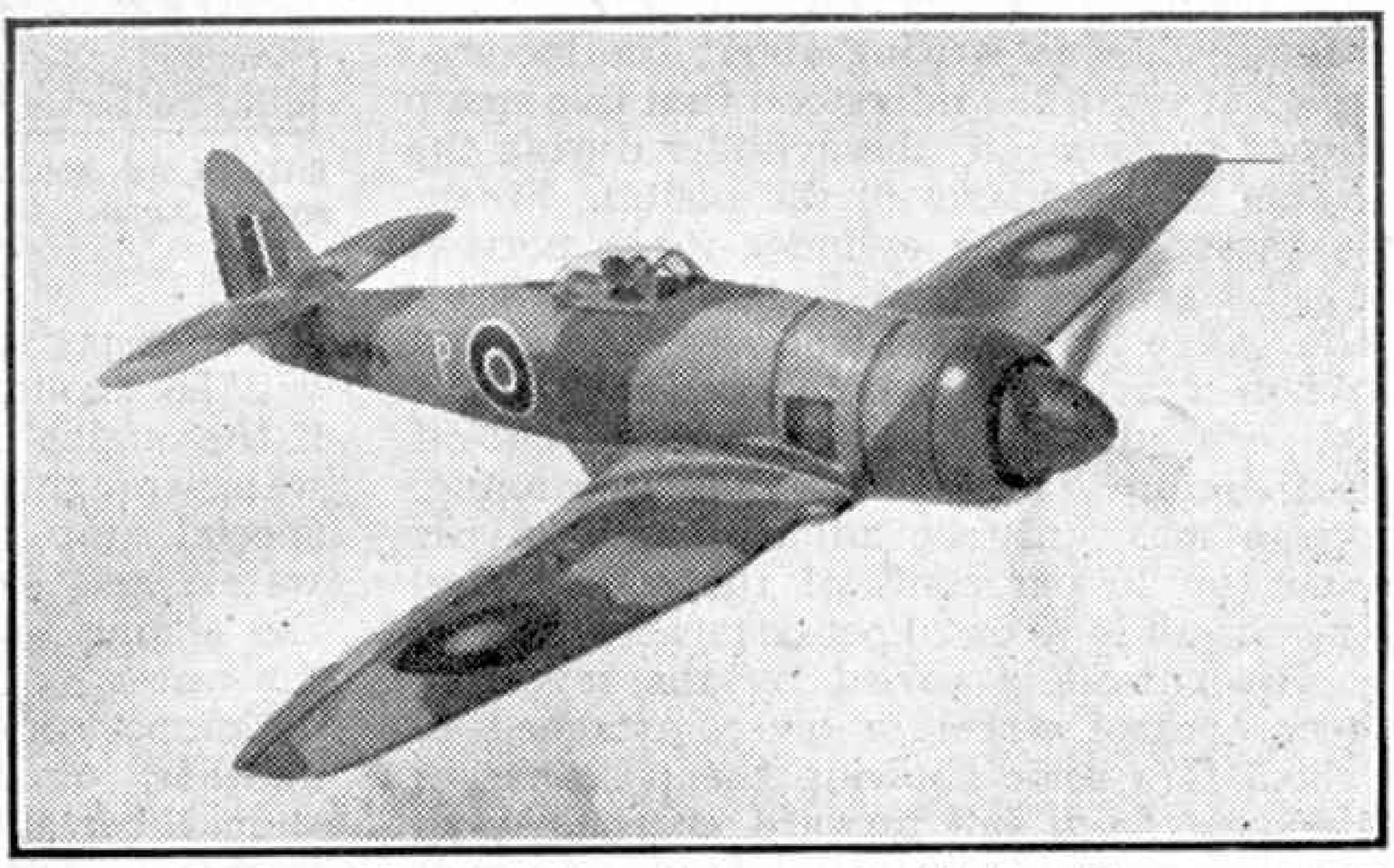
Details of more new British aircraft recently taken off the secret list are given in the following notes.

Hawker Aircraft Ltd.

The name "Fury" will bring back happy memories to older readers—memories of sleek, silver biplanes giving displays of perfect aerobatics at Hendon Air Displays in the 1930s. Now the name has been handed down to the latest and fastest Hawker fighters, the R.A.F.'s "Fury" I and the Navy's "Sea Fury" X, shown on this page. Both are single-seat low wing monoplanes, powered by Bristol "Centaurus" engines and armed with four 20 mm. cannons. In addition, two 45 gall. drop fuel tanks, six rockets or two 1,000 lb. bombs can be carried under the wings, making the "Furies" ideal attack fighters.

The "Fury" I is similar in many respects to the "Tempest" II, but is a completely new design although it has basically the same high-speed section wing. The reduction in span to 38 ft. 5 in. is due to the fact that the two halves of the wing now bolt together on the centre-line of the aircraft instead of picking up pin joints each side of the fuselage. The "Fury" is the first Hawker fighter to use all-monocoque fuselage construction, instead of the tubular-strut box structures used by this company since 1926.

The "Sea Fury" differs from the land version chiefly in the provision of hydraulically-folding wings, a deck-landing arrester hook, and naval radio. It should have a top speed of well over 450 m.p.h. Some later "Furies" will be fitted with Napier "Sabre" liquid-cooled in-line engines.



The new Hawker "Fury" fighter. It is armed with four 20 mm. cannons and can carry two 1,000 lb. bombs under the wings.

Fairey Aviation Company

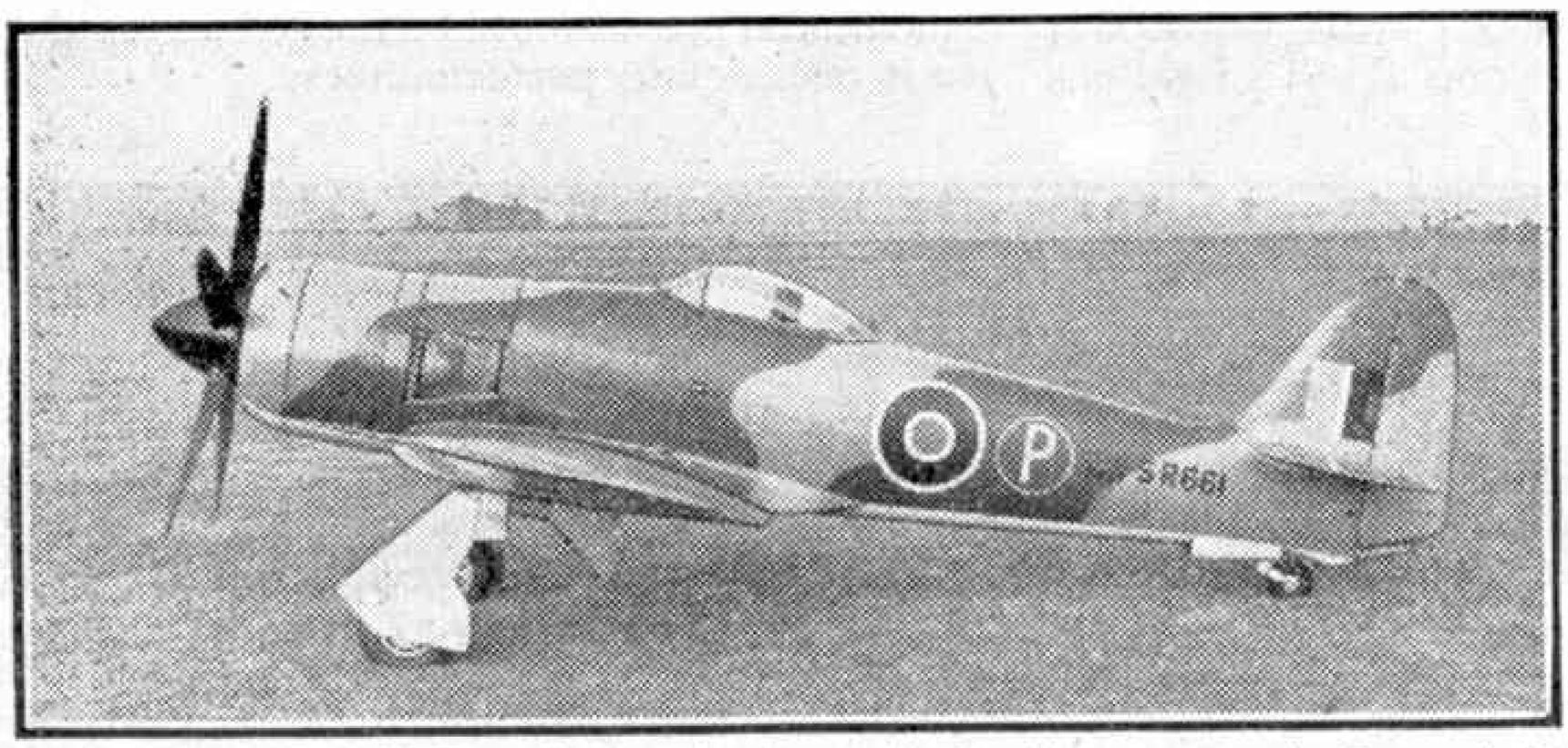
Faireys have always been famous for Naval aircraft, and their new "Spearfish" two-seat attack-bomber has an enviable tradition to carry on. It is not a handsome aeroplane, but few machines designed to Naval specifications ever are. Nevertheless it is a very formidable aircraft, armed with four .50 in. machine-guns and carrying internally a heavy load of bombs or torpedoes. The "Spearfish" is powered by a 2,585 h.p. "Centaurus" 57 engine, which gives it a top speed of 301 m.p.h. Its wing span of 60 ft., length of 45 ft. 4 in. and loaded weight of 24,000 lb. make it the largest British carrier-based aeroplane.

The "Firefly" two-seat fighter has also been extensively redesigned, and the latest version, the Mark IV, has clipped wings, which reduce its span to 41 ft. 2 in., increased fin area and leading-edge radiators. Its 2,190 h.p. "Griffon" 74 engine gives it a top speed of 346 m.p.h.

Miles Aircraft Limited

The Miles "Monitor" gunnery-trainer is now off the secret list. In 1942 it was decided that air-to-air and ground-to-air gunnery training was becoming a rather serious bottleneck as existing types of target-towing aircraft were obsolete. And so, for the first time, a specification for a target-tower was drawn up. It demanded a machine that would fly at over 300 m.p.h., reach an altitude of 20,000 ft. and have an endurance of ¾ hr. It was also required to be capable of simulating dive-bombing attacks.

The "Monitor" proved itself able to fulfil all these requirements. Powered by two 1,750 h.p. Wright "Cyclone" engines, it has a top speed of 360 m.p.h. and a cruising speed of 300 m.p.h. at 20,000 ft., towing a target. A special system of automatic target-ejection was devised, to minimise crew discomfort at high-altitudes, where the temperature is often minus 20°. The target is ejected through a step in the underside of the fuselage, and a Perspex cupola above the fuselage enables the observer to take photographs of the target during the firing practice. J.W.R.T.



Hawker "Sea Fury." The photograph shows clearly the sweep-up to the cockpit, which is a feature of this machine.

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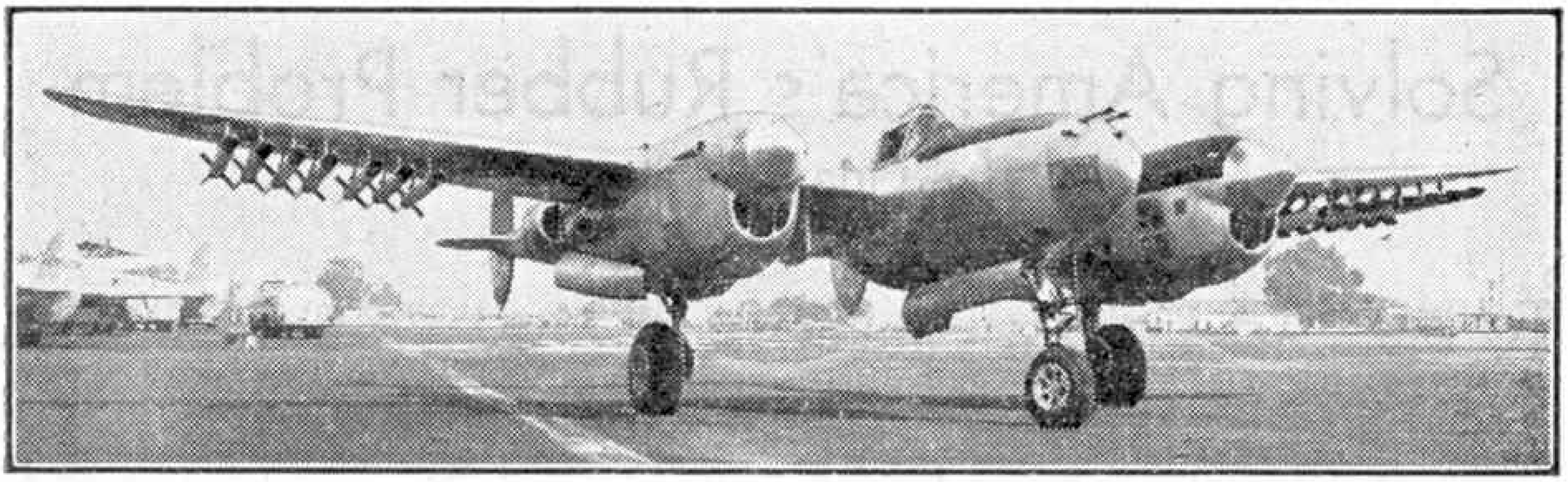
British Overseas Airways' service to Karachi has been extended to Calcutta. Avro "York" transports are used.



Lockheed P-38 "Lightning" fighter with 14 5-in. rockets carried under the wings. Photograph by courtesy of Lockheed Aircraft Corporation, U.S.A.

American Airline News

Pan American Airways have announced that they will shortly begin to use landplanes on their New York-Bermuda service. The company are now operating a daily transatlantic air service between New York and Hurn airport, near Bournemouth, and are reported to be preparing to introduce a direct air service between Lisbon and Rio de Janeiro.

American Overseas Air Lines also are now operating a daily transatlantic air service to Hurn. On Mondays an eastbound machine takes off from Chicago, on Wednesdays and Fridays from Washington, and on Tuesdays, Wednesdays, Thursdays, Saturdays and Sundays from New York.

High-Speed "Thunderbolt"

The Republic Aviation Corporation, of Long Island, U.S.A., have given details of an experimental version of the P-47 "Thunderbolt"—known as the P-47J—which was flown at over 500 m.p.h. on 4th August last year. It is shown in the lower photograph on this page.

Only this one P-47J was built, but it paid for itself many times over through distinctive features and improvements that were incorporated into subsequent models of the 15,000 "Thunderbolts" built for the U.S.A.A.F. It was powered by a Pratt and Whitney R-2800C "Double-Wasp" engine, driving a new-type Curtiss-Wright electric propeller with a special 2 in. hand-welded trailing edge. The P-47J was designed to meet specific requirements for an interceptor fighter with a high rate-of-climb and speed. Its turbo-supercharger boosted the engine to about 2,800 h.p. at 34,000 ft., for emergency use, and was so mounted that the exhaust gases ejected directly in the line of flight, giving the equivalent of about 400 h.p extra thrust to the engine. The engine cowling was completely redesigned and a propeller-driven cooling fan provided.

The high-speed flight test was made by Republic test pilot Mike Ritchie, before U.S. Army observers, and certainly makes the P-47J one of the fastest propeller-driven aeroplanes in the world. It was not put into production because this would have necessitated a considerable re-tooling programme at a critical stage in the war; instead this experimental machine was turned over to Wright Field so that it could be used for intensive flight testing.

J.W.R.T.

The "Seaford" Flying Boat

There is now a new Short flying boat, the S.45 "Seaford" which, although originally designated the "Sunderland" IV, differs considerably in design from the "Sunderlands" in service with the R.A.F.

The "Seaford" has a wing span of 112 ft. 9½ in., is 89 ft. 6½ in. long, with an overall height of 37 ft., and its four Bristol "Hercules" 130 engines drive de Havilland constant-speed propellers. It is of two-deck design, with the control cabin, crews' quarters, kitchen and part of the passenger accommodation on the upper deck and the rest of the passenger accommodation and four freight compartments on the lower deck. The design makes provision for a crew of seven, consisting of two pilots, navigator, engineer, wireless operator and two stewards.

A military version of the "Seaford" is in production.

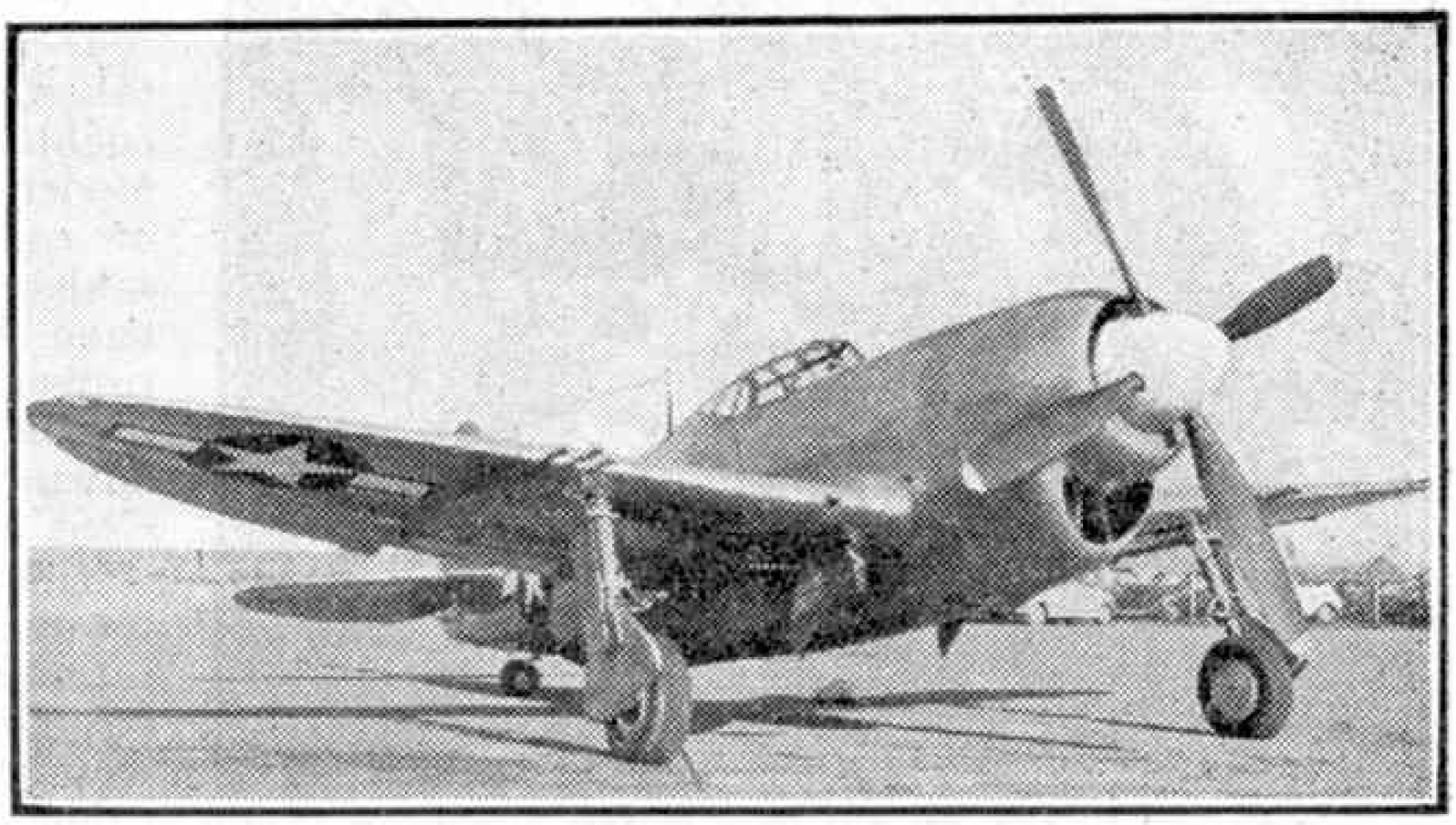
End of Novel Douglas Experimental Bomber

The Douglas XB-42 twin-engined experimental bomber that recently flew across the United States from Long Beach, California, to Washington, in the record time of 5 hrs. 17 min., averaging 432 m.p.h., crashed near Oxen Hill, Maryland, during another flight a few days later. The crew baled out and reported that the machine had developed engine trouble.

The XB-42 was an odd-looking aircraft with a novel layout that included a long shaft-drive from the two Allison engines inside the fuselage to contra-propellers aft of the tailplane.

* * * *

Three Douglas DC-6 and two Lockheed "Constellation" air liners have been ordered by Pan American Airways.



The Republic P-47J, an experimental version of the well-known P-47 "Thunderbolt," described on this page. Photograph by courtesy of Republic Aviation Corporation, U.S.A.

Solving America's Rubber Problem

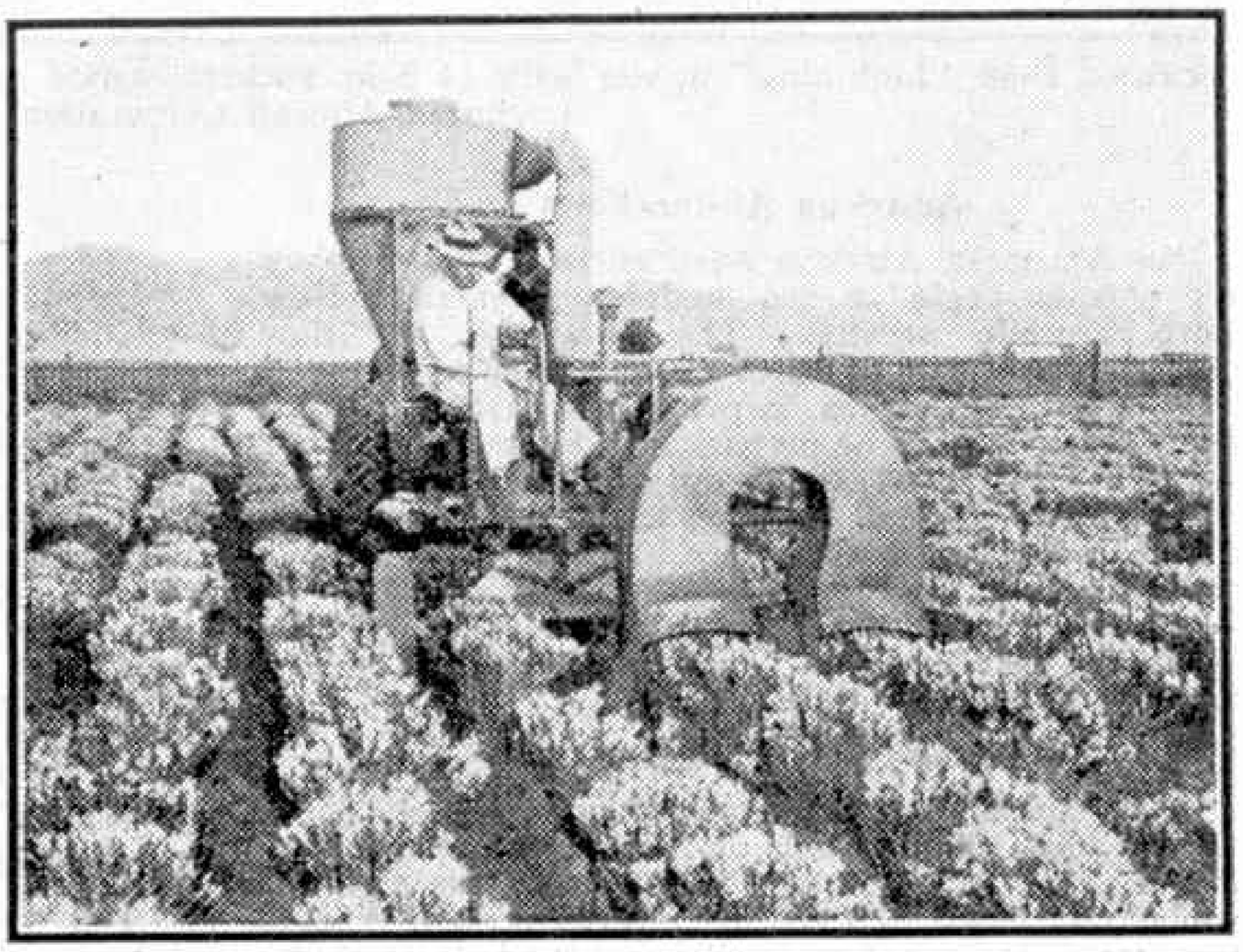
The Guayule Shrub

By M. Lorant

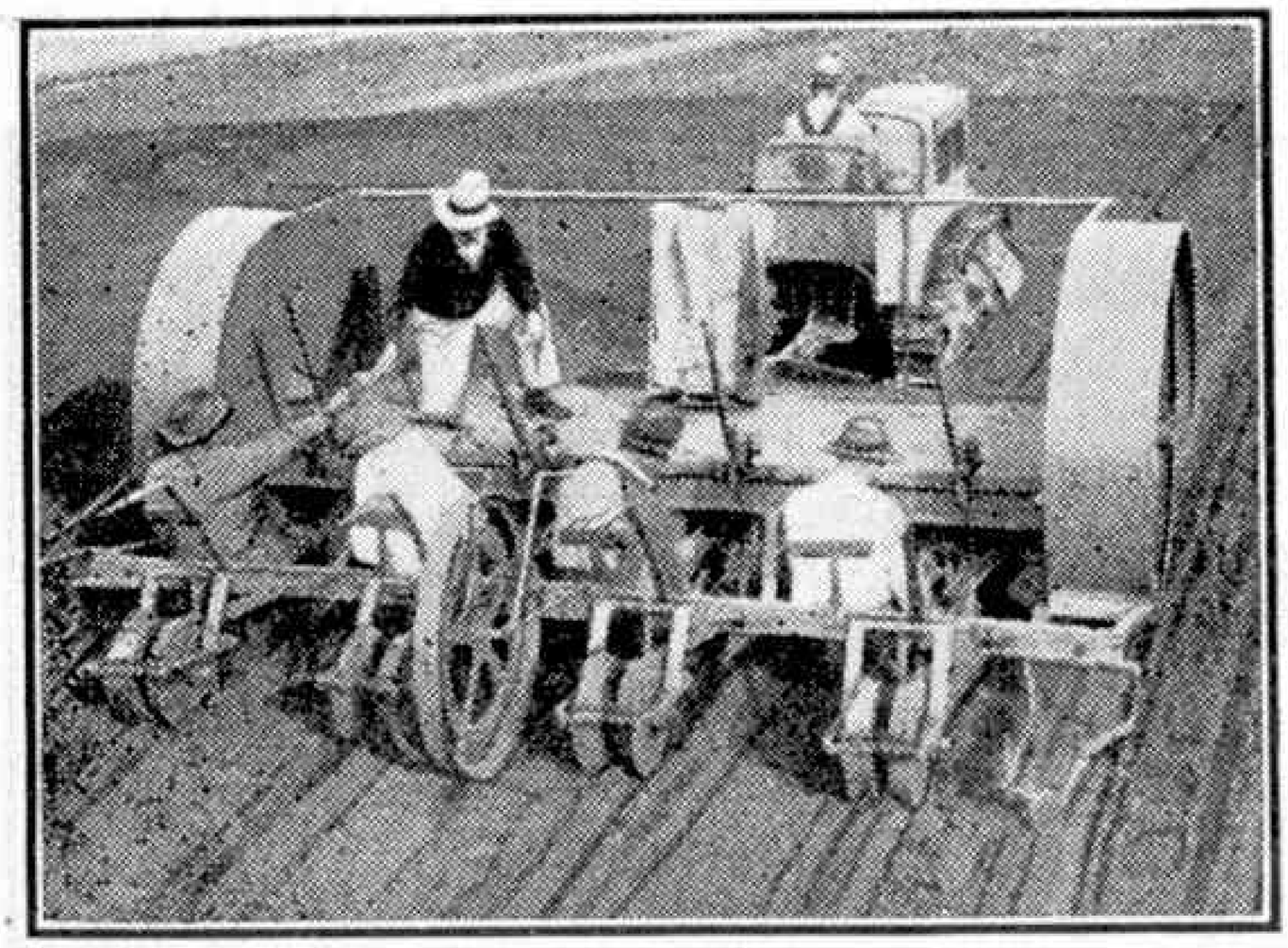
RUBBER is a prodigal son of the Western Hemisphere. It was first found growing wild in Brazil and other South American countries, transplanted to the East Indies, and then sold back to the United States as a principal customer. Now it is being re-discovered in the United States.

Half a century ago, an Englishman gathered the seed of rubber trees in Brazil, and sent them to London to germinate. The shoots were transplanted to Ceylon for cultivation, and then spread to Malaya and on into the Dutch East Indies and French Indo-China. About 1912 these sources began to turn out rubber in large quantities and since that time America has been buying rubber from the Far East in ever-increasing quantities. Of the rubber used in the United States in 1941, about 97 per cent. came from Singapore and other ports that later came into the war area or fell into Japanese hands.

The leaders of the United States rubber industry foresaw that the war might shut off America's rubber supply. They presented to the Government a plan for creating a stock pile of rubber, which would be held in reserve for just such an emergency as the war brought about. As a result of this foresight, the United States had on hand 600,000 tons of crude rubber when she entered the war, a larger supply of rubber than had ever existed in the world before.



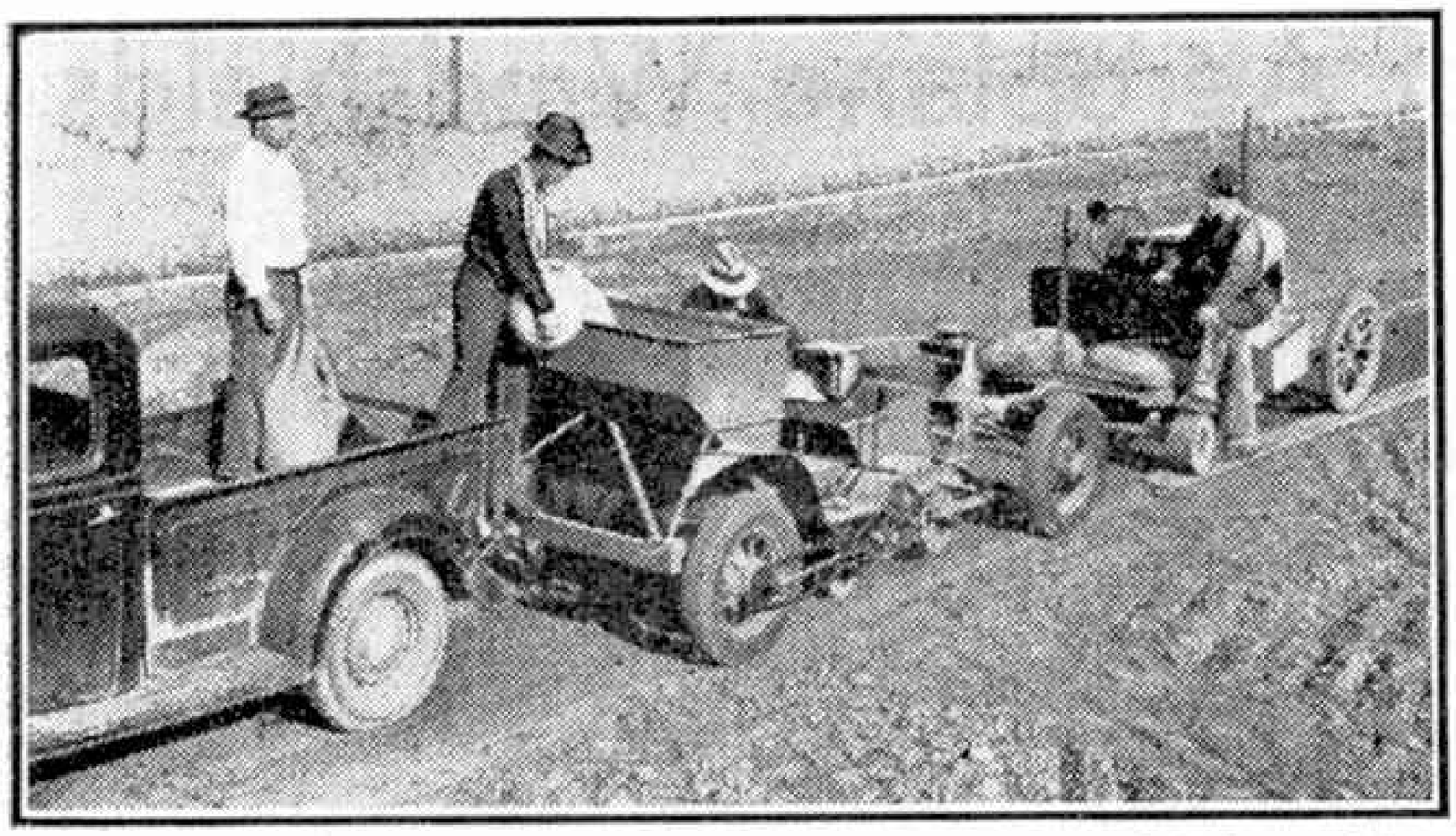
Gathering seeds from guayule plants by means of vacuum apparatus. Enough seeds to plant 10 acres are gathered from each acre of guayule shrubs.



Transplanting guayule seedlings. The machine prepares the holes and covers the roots of the seedlings dropped in by the workmen, each of whom plants 60 seedlings a minute.

If this step had not been taken, America's war machine could not have been built. Modern motorised armies travel on rubber, and the building of tanks and combat cars would have been impossible without rubber for their tyres. Because of this stock pile, the war plan advanced by President Roosevelt went ahead.

This reserve could not last for ever, and even with stringent rationing America could not stretch it out indefinitely. South America still had millions of rubber trees, but produced very little rubber, for disease has attacked the plantation trees



Sprouted guayule seeds are spread evenly over prepared nursery beds by machine. They are covered with fine sand to prevent them from being washed or blown away.

and the land has reverted to jungle wilderness, inaccessible by road, rail or water.

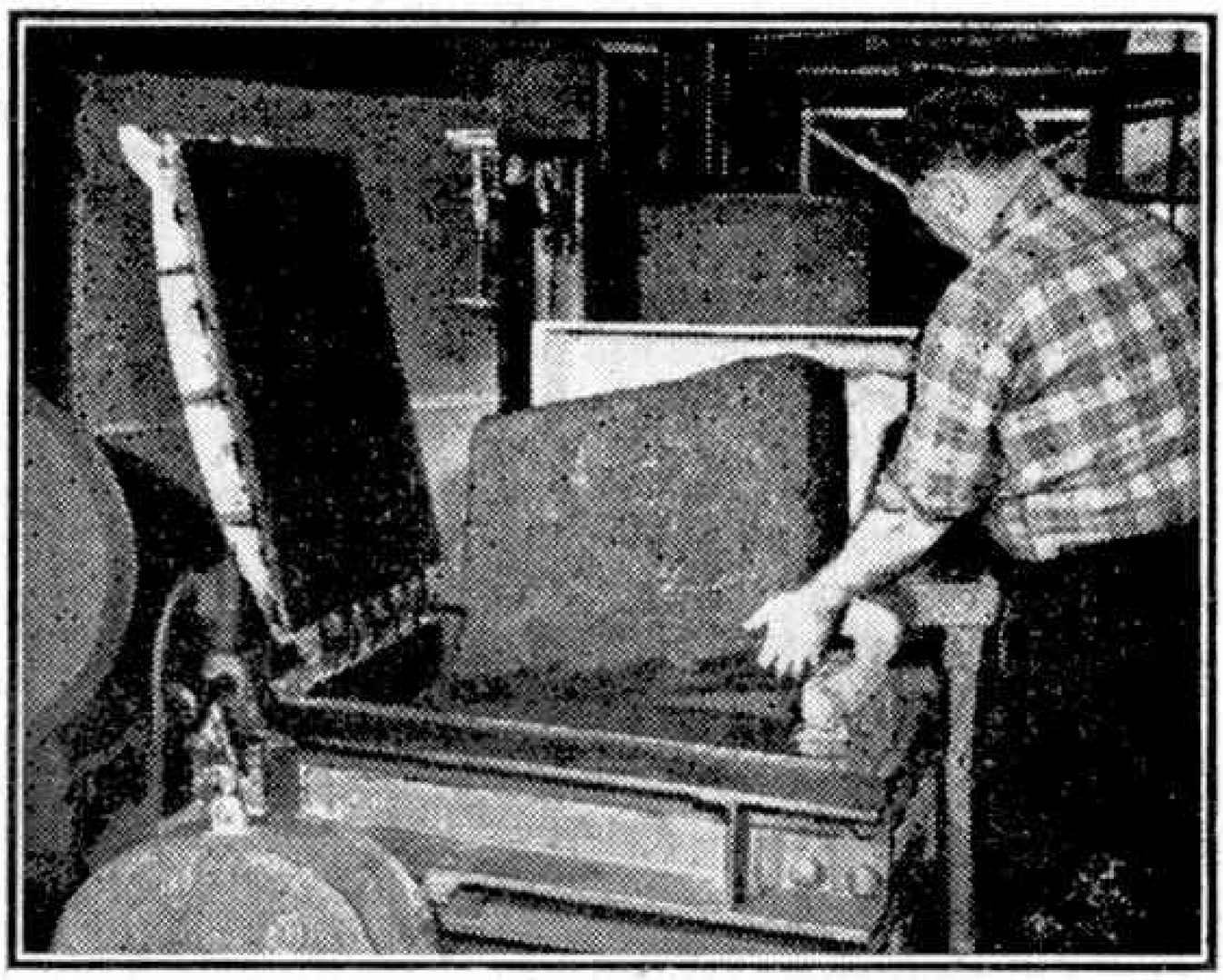
Fortunately North America has now a rubber-producing plant of its own. It was discovered 50 years ago that guayule, a shrub growing wild on the high plateaus of north central Mexico, contained 10 per cent. of rubber. Milling processes were developed and the rubber was extracted from this wild shrub and sold commercially by an American-owned and operated company. In 1912 a revolution drove the company out of Mexico, but before leaving, the company's botanists picked seeds from hundreds of varieties of this shrub and took them to the United States, where experiments have been conducted for 30 years.

Rubber company executives watched these experiments with interest and at times purchased guayule rubber for use in tyre building. Most informed on the subject of guayule was William O'Neil, president of the General Tyre and Rubber Company. His experience with guayule taught him that it made a good tyre of real rubber, just as tree rubber is real rubber. Experience and experiment taught him also that science so far had developed no way of making a satisfactory tyre entirely of synthetic rubber. Real rubber must be mixed with the synthetics before these can be used efficiently in tyre building.

Guayule is known to-day to millions of Americans who never before knew that America could grow her own rubber in an emergency. The American shrub of to-day is far superior to the wild one brought to the United States 30 years ago. By seed selection and cross breeding, and by experimental plantings of various seed types in different areas in the south-west of America, botanists have developed a shrub that grows larger and gives 23 per cent. of rubber instead of the 10 per cent. of the original shrub.

Experiments have shown that guayule demands a winter rainfall of 12 in. to 15 in. or comparable irrigation. It cannot stand winter temperatures below 15 deg. F., and a long dry spell in the summer months is essential.

Rubber is extracted from the root and branches of the guayule shrub. The entire plant is uprooted, dried and crushed. The mash, or pulp of the crushed plants, is then immersed in huge water-filled vats. The wood sinks to the bottom, while the rubber and cork from the bark of the shrub rise to the top and are skimmed off. Next water is forced under pressure into the air holes in the cork, which then sinks in the next flotation. The remaining rubber is then skimmed off, washed several times and pressed into 100 lb. slabs.



Guayule rubber pressed into 100 lb. slabs.

Bird-Proof Aeroplane Windshields

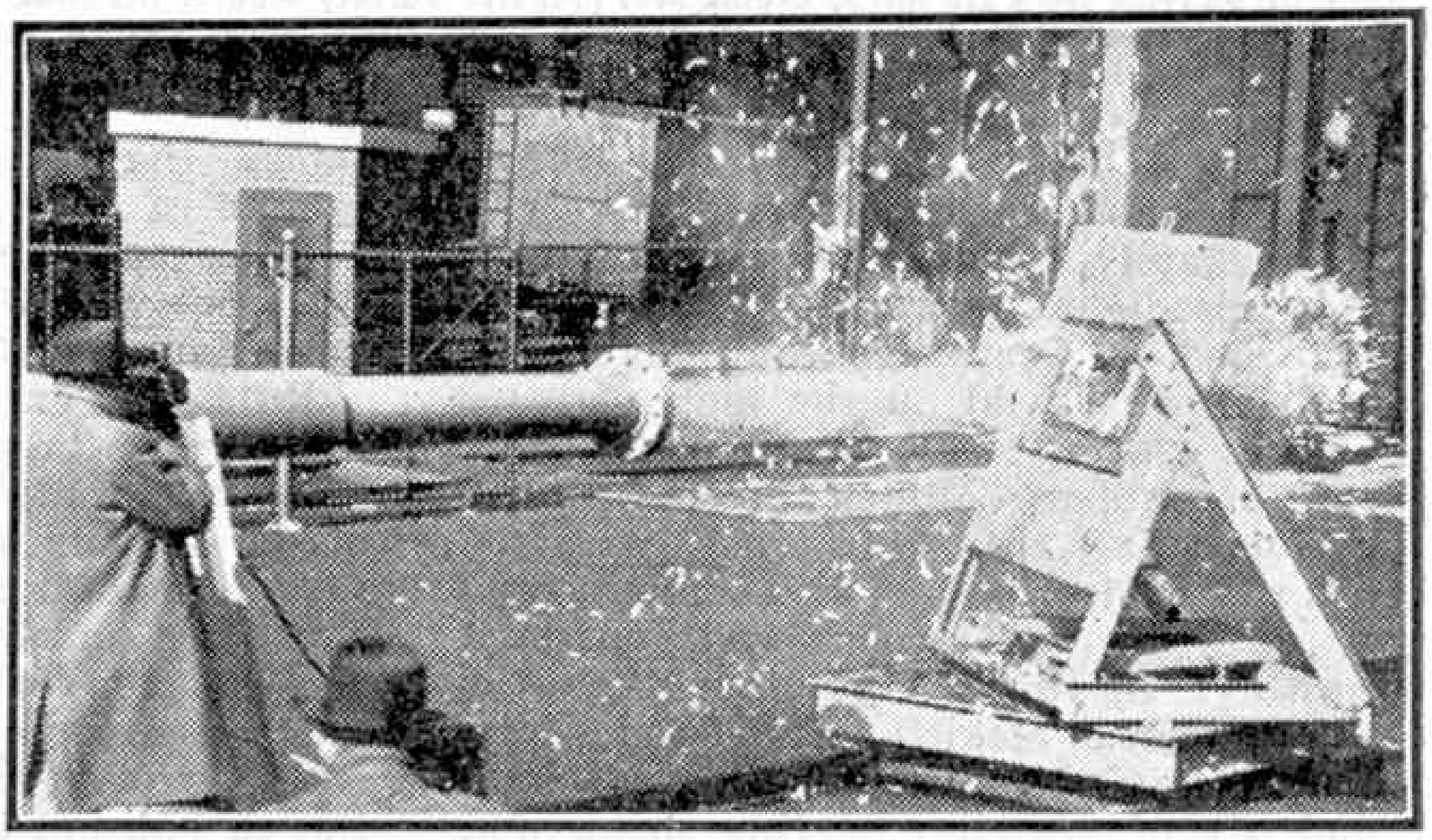
By M. Lorant

A MEDIUM-SIZED bird smashing into the windshield of an aeroplane can cause a lot of damage. There have been many such collisions, especially during the migrating season, and some crashes that can't be explained in any other way may have been caused in this manner. For example, records show that one bird broke through the windshield of an aeroplane, punched a hole in the metal bulkhead of the pilot's compartment, travelled the length of the plane and burst through the rear wall into the baggage compartment.

Until now the windshields used in transport aircraft were somewhat similar to those of cars. They had two layers of glass with a thin plastic filling, which shattered under the impact of a 15-lb. bird at speeds under 100 m.p.h. When seeking a stronger glass, the engineers of the Westinghouse Company devised a 20 ft. "cannon" that would shoot birds at a windshield panel, simulating as nearly as possible conditions that might be encountered in actual flight. The engineers were able to design and construct such a gun in a few weeks, because the essential parts had already been developed for high voltage circuit breakers, big switches that blow out an electric arc with a blast of compressed air travelling faster than sound. The gun was fitted with interchangeable barrels for use with different sized test missiles, which in some cases consisted of bodies of chickens and turkeys, and these were fired by compressed air at the glass panels being tested.

Using the cannon, experts developed new windshields consisting of a single layer of full-tempered glass on the outside, an air space and then an inside panel made of two sheets of glass separated by a thick filling of plastic. Air, heated by the engine exhaust, circulates in the enclosed space to de-ice the windshield. The full-tempered glass is heat treated to make it seven times as strong as ordinary glass. The plastic in the rear pane extends an inch or more beyond the two glass layers and the bolts or clamps that hold the pane in the windshield-frame are fastened in the plastic, which acts as a shock absorber. Such a shield is capable of withstanding the impact of a 15 lb. bird at 200 m.p.h.

The trick of making the test missiles travel at high speeds lies in releasing compressed air from a storage tank in less than a tenth of a second. This was done by a magnetically operated valve, which was taken from a circuit breaker. Air compressed by an electrically driven pump is stored in a large tank underneath the barrels. The pressures required for the experiments ranged from 100 to 200 lb. per sq. in. The speed of the missiles was governed by air pressure and by the position of the bird in the gun; the nearer the muzzle, the lower the speed.



An aeroplane windshield fails during a test with a compressed air gun.

Stories are often circulated of Midwest cyclones driving fragile straws through the walls of wooden buildings, so the researchers decided to test the authenticity of such tales with the cannon. They must be accurate, for the cannon pushed straws into a three-quarter-inch thick pine board mounted a foot in front of the muzzle. The board looked like a porcupine after the shot, and it was even found possible to drive the straws all the way through the thick pine boards by using greater pressures. Nails mixed in the straw were hammered through the board as neatly as any carpenter could do it.

Recent Trolleybus Progress

By Gordon O. P. Pearce

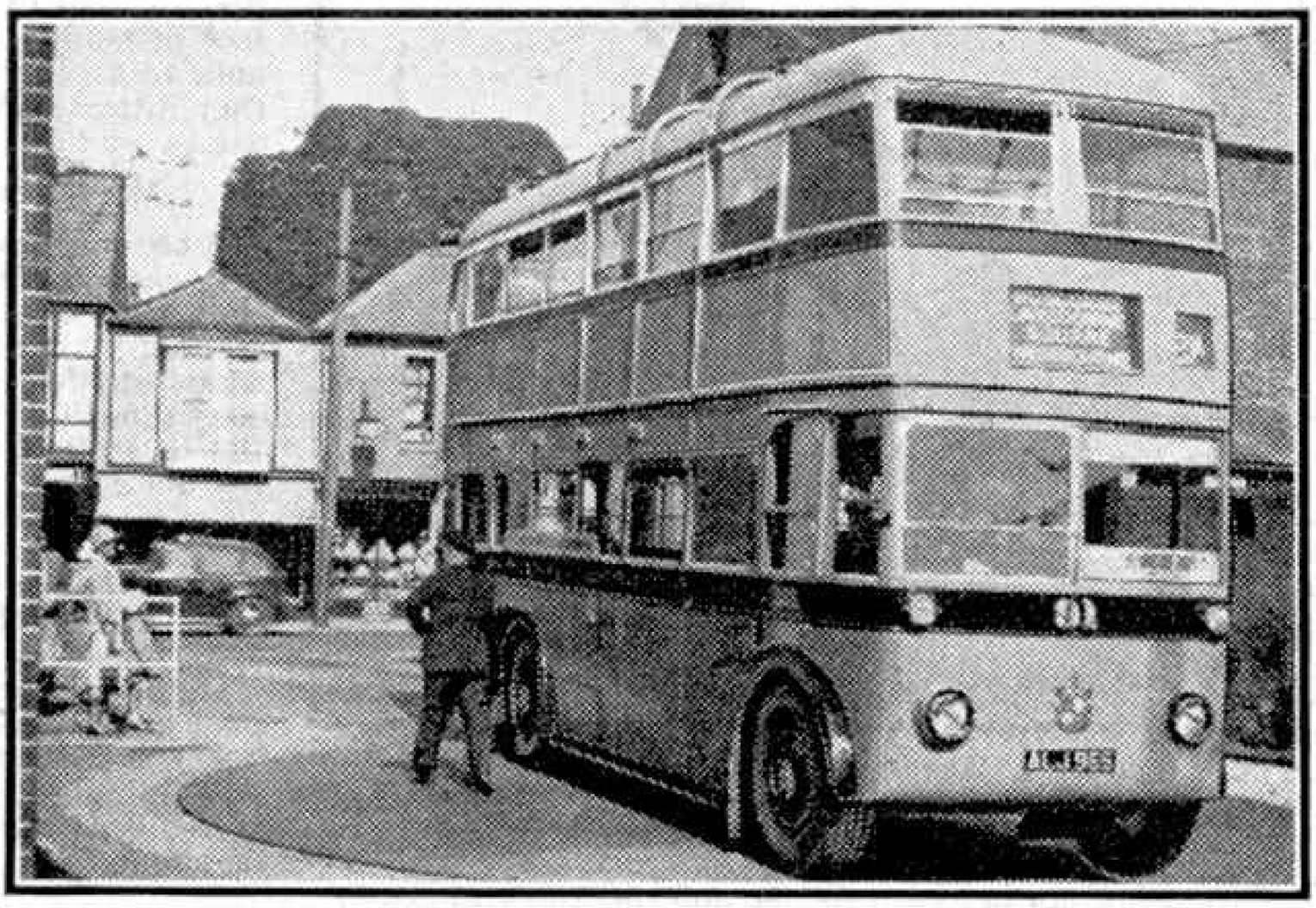
AT the outbreak of war, municipal transport in this country was being transformed through the change from one form of transport to another. Many towns were losing trams in favour of more mobile means of conveyance, and the trolleybus, hitherto little developed here, suddenly revealed itself capable of solving many of the problems that presented themselves when a decision was made to "scrap the trams."

Briefly, trolleybuses afford advantages over the alternative, omnibuses, in that existing electrical equipment is used, carrying capacity is greater, acceleration is more rapid, and there is an absence of fumes, noise and vibration. Trolleybuses are now subject to horse-power taxation, but maintenance is more simple and less costly.

Until the early 1930s trolleybus design was merely the adaptation of an omnibus chassis, with the substitution of an electric motor for the internal combustion engine, and some readers may be familiar with this earlier type as operated by the London United Tramways or the Notts. and Derby Traction Company. These vehicles had dummy radiators. With the realisation of the possibilities of the trolleybus, manufacturers such as A.E.C., Leylands, Sunbeam and Guys commenced research and re-designing, and some fine vehicles appeared. The decision of London Transport to substitute trolleybuses for trams gave further impetus, and buses to seat 70 were ordered and are in service in the Metropolis.

A few figures will illustrate the development of the trolleybus in service in the years before the war. In 1932 some 500 trolleybuses were operated by 19 municipalities, with a further 240 by other operators. By 1939 over 1,400 were operated under 30 municipalities, while other operators ran over 1,800. Overseas development too proceeded apace, and British vehicles were supplied to Cape Town, Durban, Johannesburg, Sydney, Montreal, Rangoon, Delhi, and other places.

Features of interest in trolleybus design indicating recent progress include electrical braking, in addition to air and ordinary braking. These make the vehicle ideal and economical for urban operation, particularly where gradients are severe. The substitution of carbon-insert trolley-heads for the trolley-wheels has eliminated the "swish" and rendered current collection noiseless, and the placing of the motor, resistances and transmission between the frames permits the maximum body space to be used above the chassis. Some vehicles are provided with batteries to facilitate manœuvring should the electricity fail or road obstructions occur.



A Bournemouth Corporation trolleybus on the turntable at the Christchurch terminus. The use of a simple turntable avoids the need for a large turning circle equipped with overhead wiring.

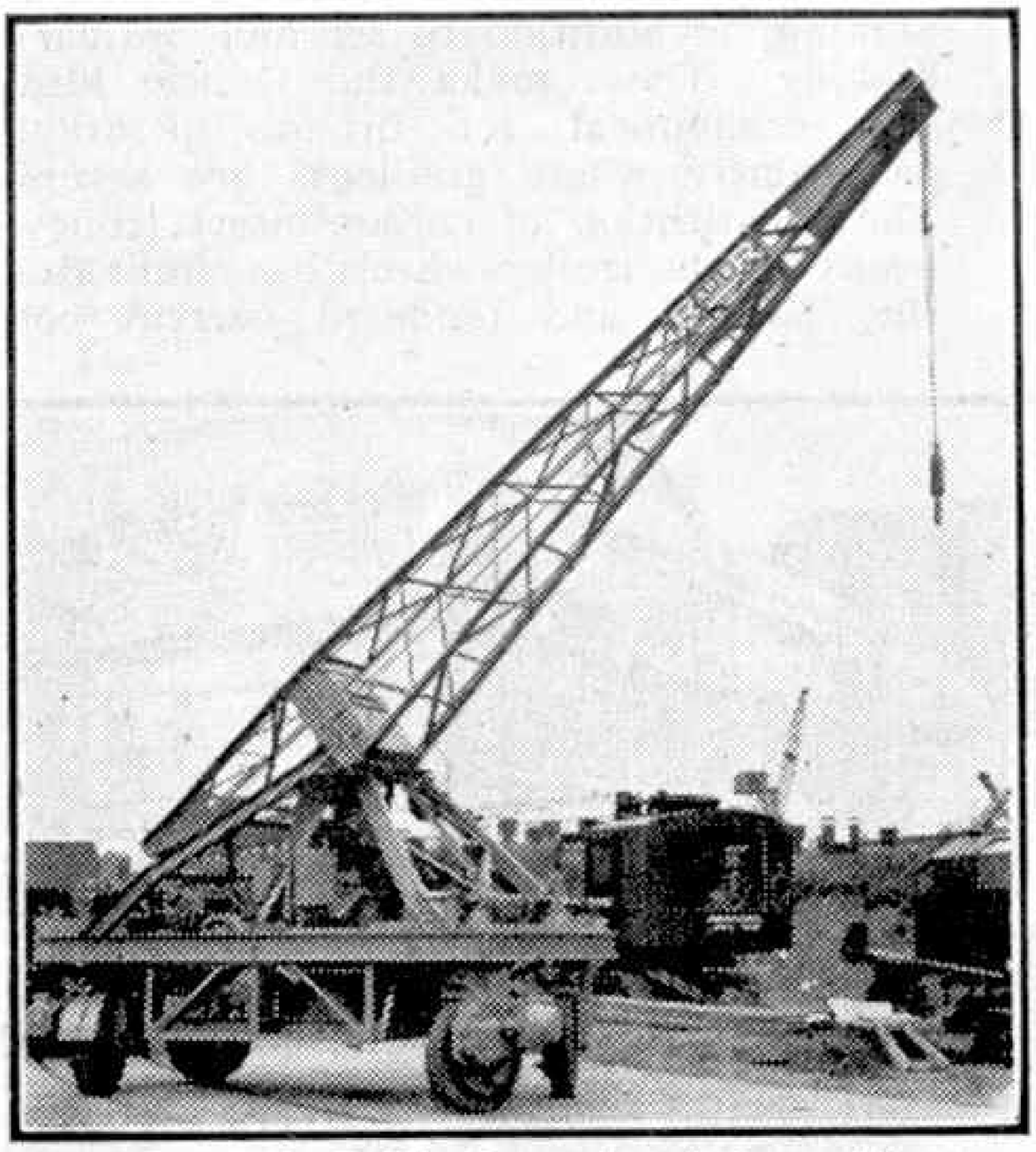
In body design one sees such features as dual exits on trolleybuses in Bournemouth and Newcastle, where a pneumatically-operated folding front door facilitates rapid unloading. Central entrance bodies are favoured in Grimsby and Darlington, while "Pay-as-you-Enter" designs have now appeared in Cardiff and London. Special low-loading bodies have been evolved for Reading, St. Helens and Portsmouth, owing to the presence of low over-bridges.

A point to remember is that the power source of the trolleybus is home produced coal.

Engineering Notes

A New Type Mobile Crane

The illustrations on this page show a new type mobile crane that has several interesting features. It is known as the "Centurn" Mobile Crane, and is a product of Ransomes and Rapier Ltd., Ipswich,



The "Centurn" Mobile Crane described on this page. We are indebted to Ransomes and Rapier Ltd., Ipswich, for our illustrations.

to whom we are indebted for our information and the accompanying illustrations.

All of the four wheels on which the crane chassis is mounted are steerable, with the result that the crane can be turned about its own centre in its own length. This valuable feature makes the crane particularly suitable for working in cramped places and enables it to turn sharp corners. The crane illustrated, when fitted with a four part hoisting block, will lift 8 tons at a maximum radius of 11 ft., or 4 tons at a maximum radius of 18 ft. 8 in. By substituting a two part block, a conversion that can be carried out in a few minutes, it will lift maximum loads of 4 tons at the reaches mentioned, with a hoisting speed of 32 ft. per min. instead of 16 ft. per min., which is the maximum for a four part block. The crane will travel at a speed of 3½ m.p.h. when carrying a load of 8 tons.

The movements are operated through direct current motors supplied with current from a generator driven by a petrol engine. The control switches are placed close to the driver's position and engage or disengage the various motions as required. Steering of the wheel castors is carried out through an ingenious system of cam gears and wire ropes, the whole arrangement being designed to provide true tracking of the wheels.

Each wheel of the chassis is driven by a separate motor, which is mounted on the castor and operates through a worm gear. This system automatically provides for the necessary differential action. Each wheel is also fitted with cam-operated internal expanding brake gear. Owing to the fact that the wheels are mounted in castors it is necessary to carry the electrical and brake cables to the required points through the centre of the castor shaft.

Life-Boat with Engine Amidships

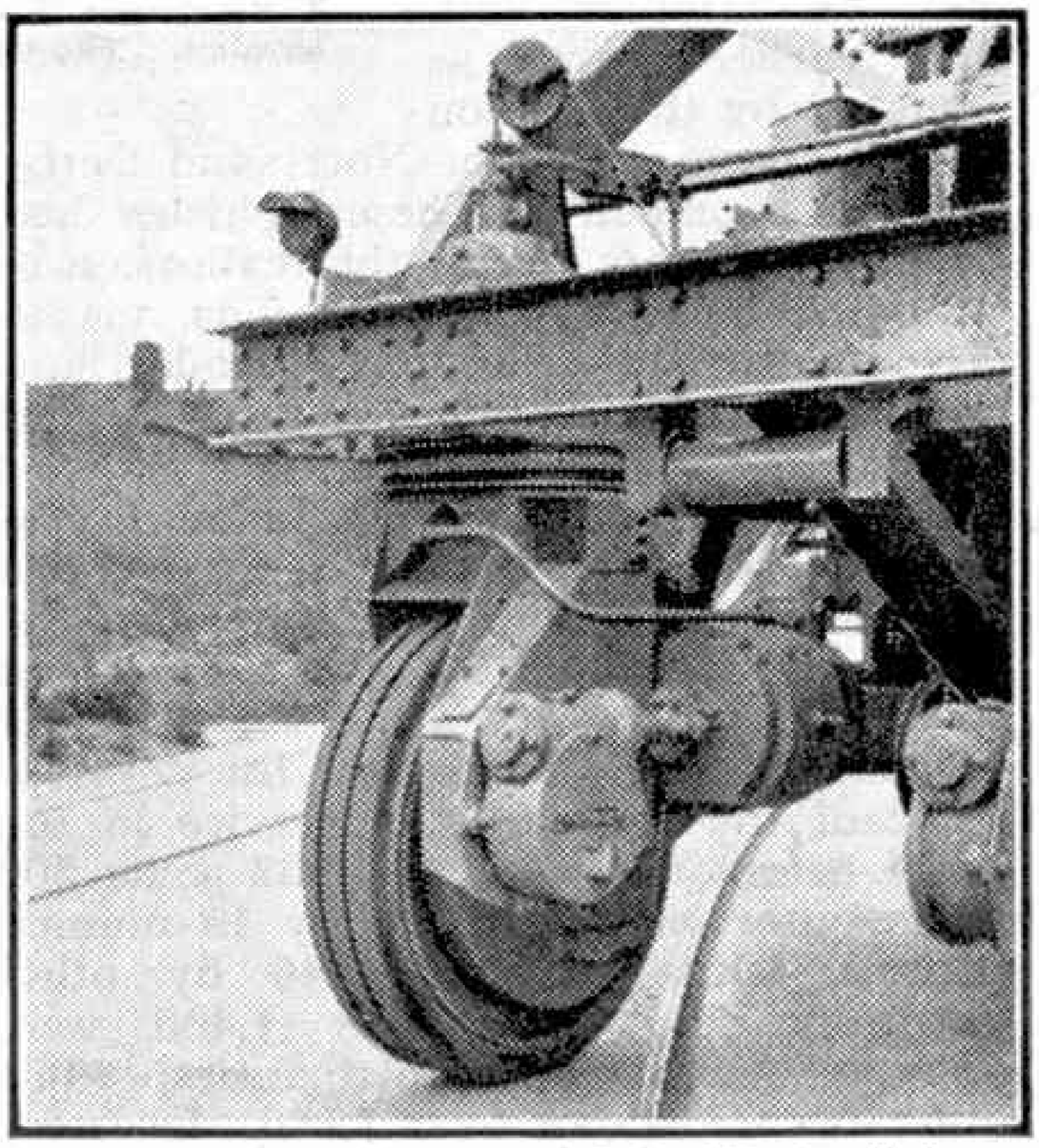
A new type of life-boat has recently been built for the Royal National Life-Boat Institution. In the past all life-boats, both motor and sailing types, have been steered from aft; in this new boat the wheel is placed just forward of amidships. The engine controls also are placed amidships, so that the motor mechanics will still be just in front of the coxswain, and able to act at once to his orders. The boat is 46 ft. long, with two 40 h.p. Diesel engines, and has a speed of just over eight knots.

During 1945 the life-boats of the R.N.L.I. saved 537 lives. In the first four months of the year, up to the end of the war in Europe, they rescued 223 persons, and in the eight months of peace 314. In face of many difficulties the Institution have been able to lay down eight new life-boats of the 80 they intend to build to make up for the losses and delays of the war.

Moving a Pre-Fabricated Radio Station

A pre-fabricated radio station weighing 2,500 tons and comprising 30,000 components, was recently conveyed by the L.M.S. from Heckmondwike station, en route to the Far East. Eight special trains of 304 vehicles were used to carry the huge consignment, which included everything from four 180 ft. steel towers packed in 7,000 pieces, to pins for office use. There were 400 drums of cables, 80 miles of telephone wires, 3,300 valves, electric generators, transmitters, typewriters and other office equipment, together with a huge quantity of tools, nuts, bolts and nails. Altogether there were over 11,000 wooden cases in which most of the material was packed. The cases are also designed for use as shelves in the erected station.

When the station is erected in the Far East it will compare with any of the larger wireless stations in Great Britain, and will have a range of about 5,000 miles.

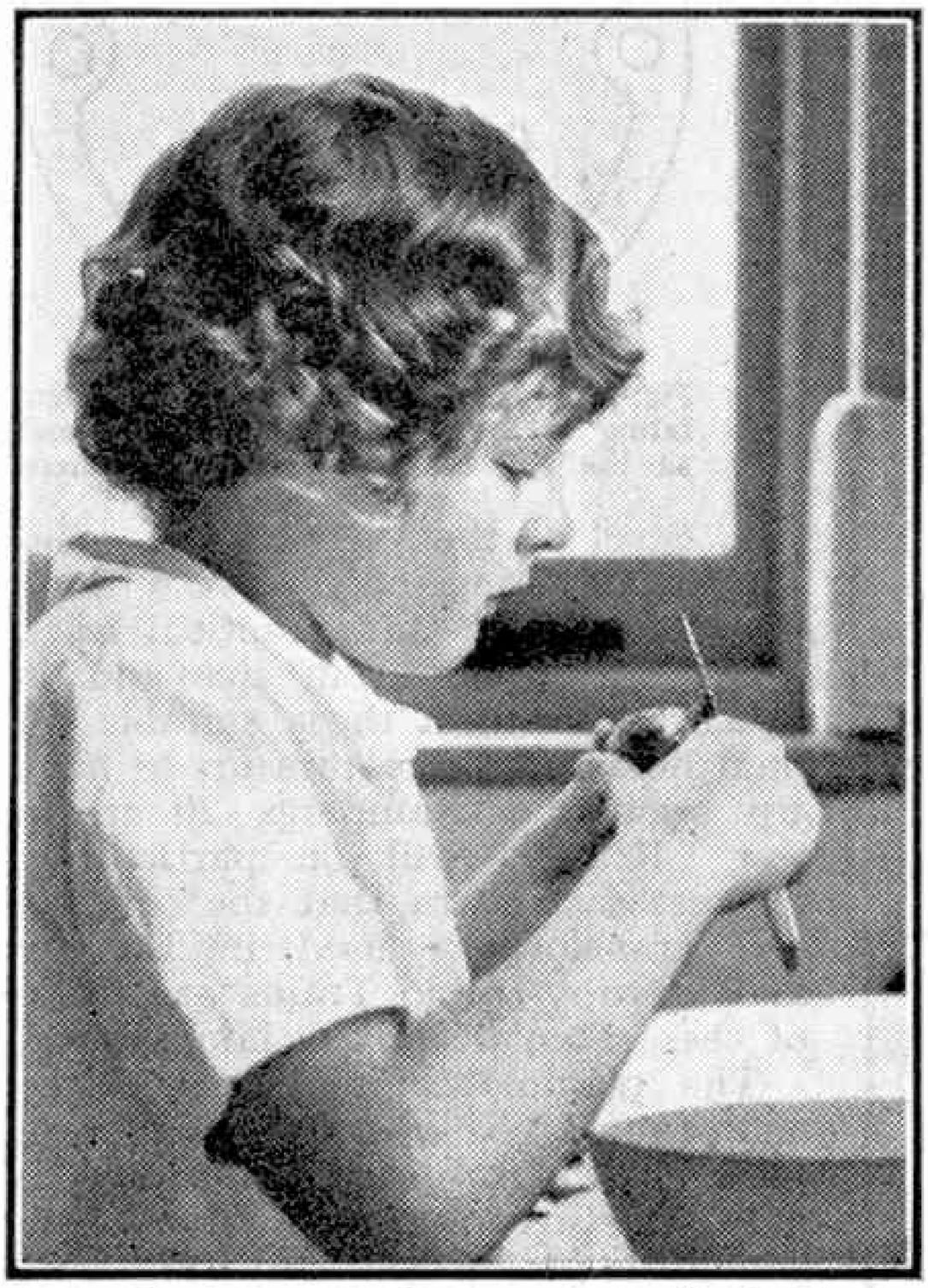


A close-up view of a castor of the "Centurn" Crane.

Photography

Indoor Pictures of the Family at Work and Play

THERE should be little need nowadays to emphasise the fact that amateur photography is no longer a hobby for the summer only. Modern films, lenses and cameras have made photography independent of sunny days and made easy the taking of pictures indoors that would have been impossible even a few years ago. This is a great advantage during the short days of winter, when outdoor picture-hunting excursions are less attractive than in the summer.



"Her Good Deed." Photograph by E. E. Barnes, Wembley Park.

The home itself will provide many excellent opportunities for really good pictures, especially where there are several members of the family. Provided that care is taken to select the lightest parts of the house near the windows as the site for the photograph, there is plenty of work that can be tackled quite successfully even with a simple camera. There are no better indoor subjects than the various members of the family engaged in their ordinary routine household tasks or hobbies, and there is a variety of activities going on all the time.

"The Model Maker." Photograph by J. Marland, Hanwell, W.7.

Mother or sister at work in the kitchen can be made the subject of a really interesting picture, and an excellent example of this kind is shown at the foot of this page. Dad reading his paper or brother engaged in one of his hobbies are other opportunities for the photographer on the look-out for worth-while pictures of an unusual and realistic type.

Usually it is possible to arrange matters so that the best use can be made of the light from windows. Notice how this is contrived in the pictures of the little girl peeling potatoes and the kitchen scene shown on this page. By arranging the setting in this way there is no necessity for very large aperture lenses, provided one of the modern ultra-rapid films is used, for it is usually possible to give a fairly long exposure. During the winter evenings many such pictures can be made by artificial light.

"The Kitchen Front." Photograph by W. Silvester, Bromley.

Meccano in a Costing Office

A Fine Machine for Calculating Areas

REFERENCE has been made on several occasions in the "*M.M.*" to interesting uses to which Meccano has been put in actual engineering practice. We have given several examples illustrating how inventors, designers and research workers in many different industries have been helped in their work by means of apparatus and experimental mechanisms built up from standard Meccano parts. Still another example came to our notice recently. It is a planimeter, an instrument designed for calculating areas, and is in daily use in one of the largest sheet steel stamping works in this country.

The machine is shown in the photograph on this page. It was designed and developed almost entirely in Meccano by Mr. Ronald Sankey, a Director of Joseph Sankey and Sons Ltd., for use in the company's great Bankfield Works at Bilston. This is only one of several large works owned by the company and is chiefly concerned with the production of electrical stampings in sheet steel, such as are used for building up laminated motor and dynamo fields and armatures and transformer cores. These stampings are made of a special Electrical Steel of the very highest magnetic efficiency, developed by a long period of research and practical tests. They vary greatly both in size and in shape, and range from those suitable for fractional horse-power motors up to huge built-up segmental stampings 20 ft. in diameter. Readers will be particularly interested to learn that the cores of the Transformers used in Hornby and Hornby-Dublo Trains are made of these special Sankey laminations.

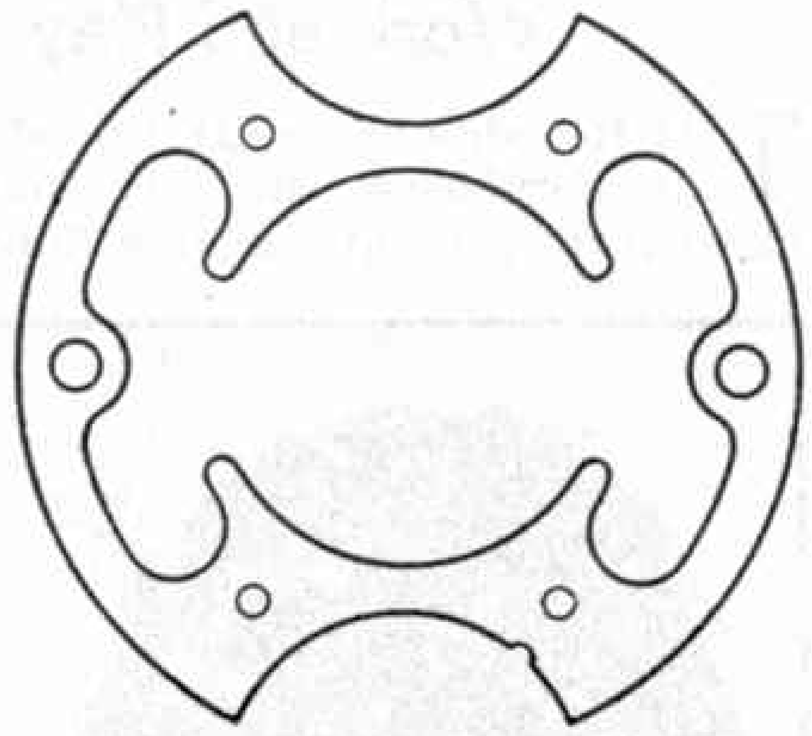


Fig. 2. The planimeter is used for calculating areas of irregular surfaces such as that of the stamping shown here.

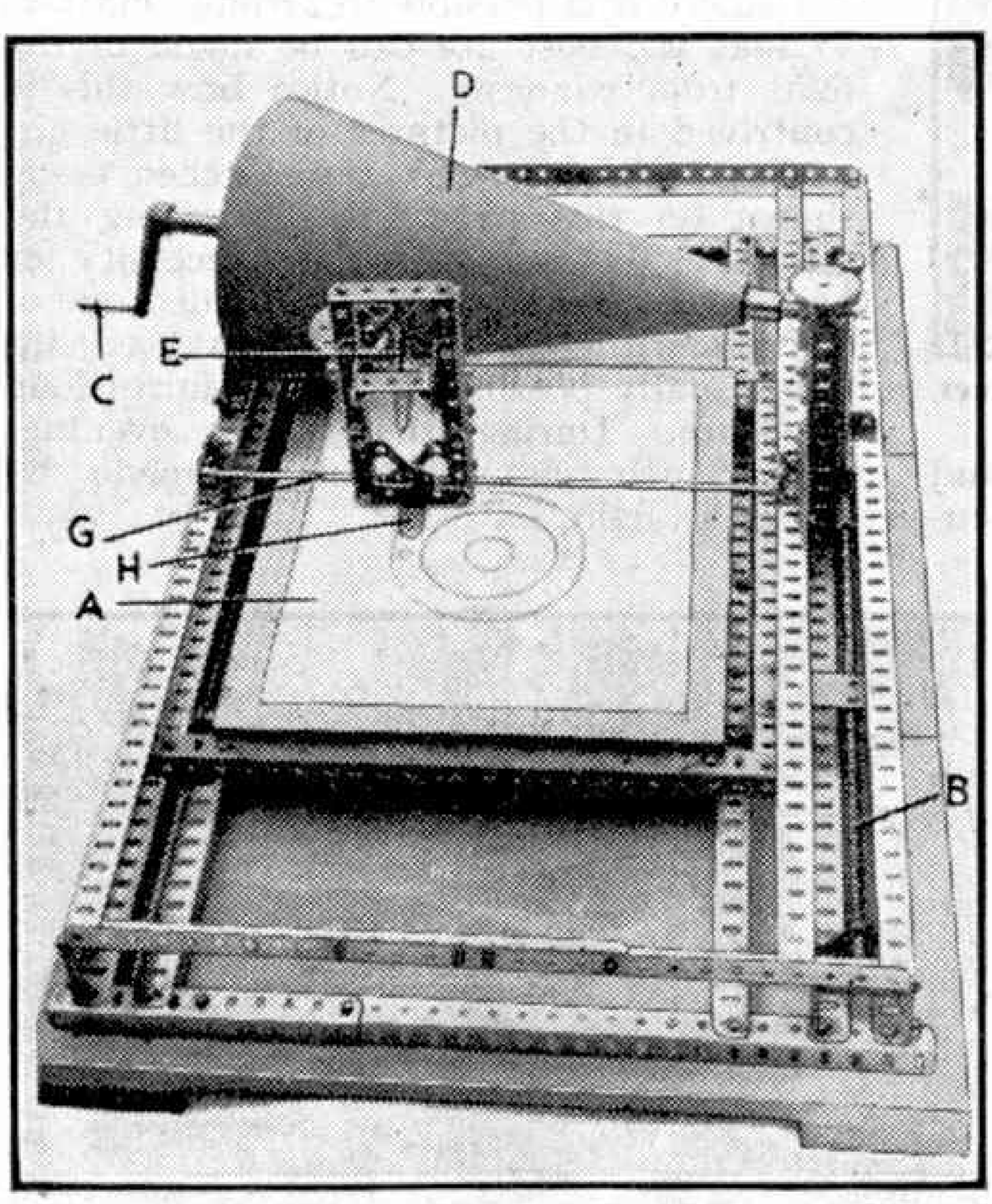


Fig. 1. General view of the Meccano planimeter designed and built by Mr. G. R. Sankey. It is shown here fitted with a counter and tracing sight made from Meccano parts.

The planimeter was designed to enable unskilled operators to obtain from drawings and blue-prints the areas of irregular laminations, on which the production costs are based. Although various commercial machines are of course available for such work, it was found that these were unsuitable for operation by unskilled workers owing to the use of fine vernier gauges, which are difficult for an unskilled worker to read accurately.

Briefly the machine consists of a movable cork-faced carriage A, Fig. 1, on which the drawing of the area to be measured is fixed. This carriage is moved to and fro by the action of a lead screw B which is set in motion through gearing by turning a handle C. Mounted on the shaft of this handle is a friction cone D, against which bears a small friction wheel E that in turn is linked up to a counting meter F, Fig. 4, of a type somewhat similar to a mileometer used on bicycles. Fixed to

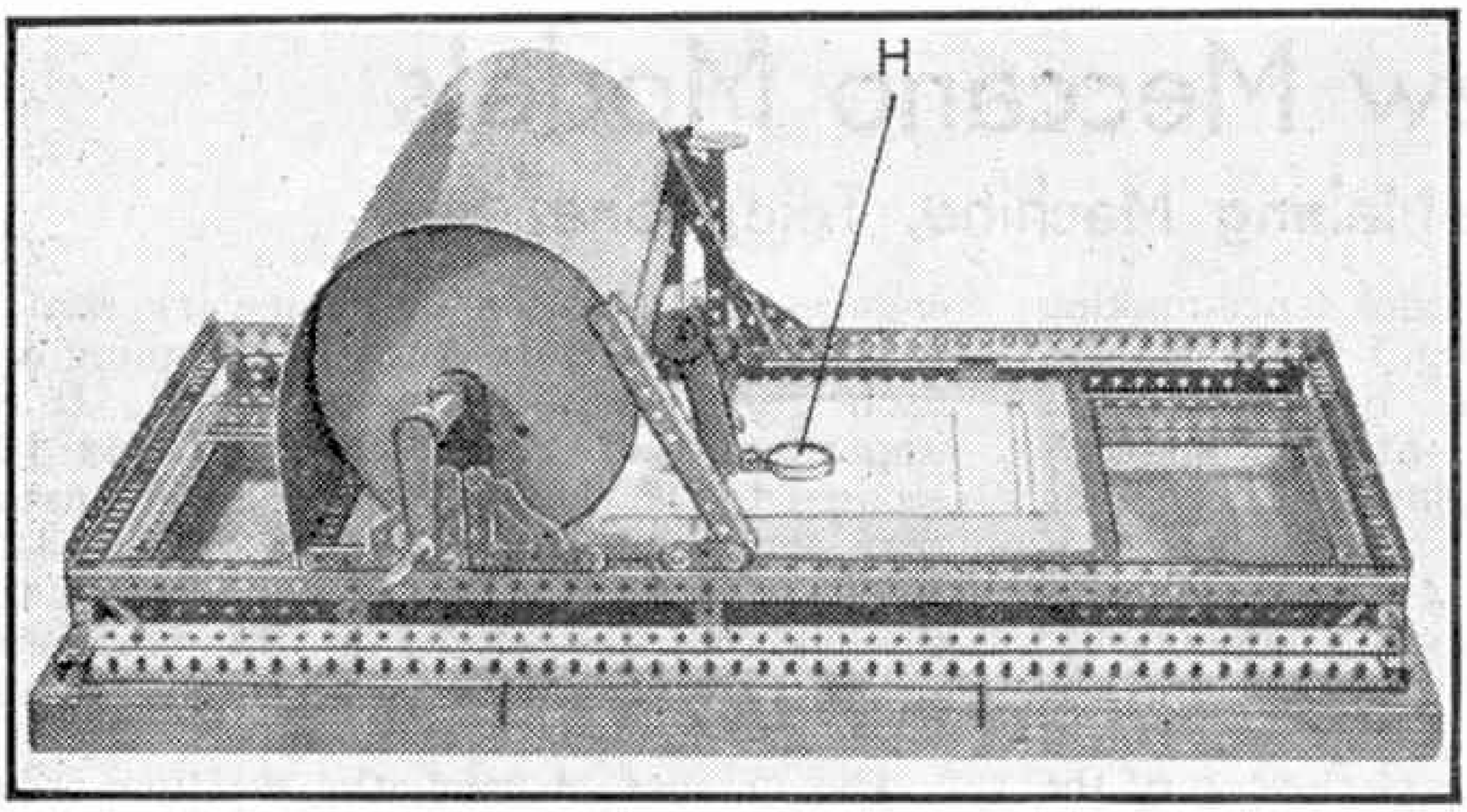


Fig. 3. The planimeter fitted with a commercial counter, a glass disc tracing sight and protective cover over the cone.

the frame of the machine is a transverse support G that carries a tracing sight H, which is slideable on the rod. In the machine actually in use the tracing sight is a round glass disc with a tiny black spot at its centre. There are other parts of the mechanism of course, but those already mentioned, together with an indicating dial J, are the essentials.

A quite reliable counter can be made from Meccano parts and in Fig. 1 the machine is shown fitted with a counter of this kind. This mechanism is just as accurate as the one actually in use, but is not so convenient in operation. This illustration also shows the machine fitted with the original tracing sight that was used, and it will be seen that this consists merely of a Strip, the outline of the drawing being sighted through the end hole.

To measure the area of a drawing the procedure is as follows. The indicating dial J is set to its starting point. The operator then rotates the handle of the machine while simultaneously tracing the outline of the drawing with the sighting dot on the glass disc. This is made possible owing to the carriage to which the drawing is pinned moving slowly forward and the fact that the sighting disc is slideable transversely. This procedure is continued until the outline of the drawing has been completely traversed and the tracing dot has returned exactly to its starting point on the drawing. The finishing point is shown precisely by the indicating dial J.

It has been found that with the particular size and angle of the cone in use, and by using a friction wheel 1 in. in diameter each 100 units shown on the counter represents an area of 1 sq. inch. From this it will be seen that the area enclosed by the outline of the drawing traced is proportional to the reading on the counter at the completion of tracing. It is a simple matter to alter the number of units per square inch either by altering the angle of the cone, the pitch of the lead screw that moves the carriage or the diameter of the friction wheel.

The original machine built by Mr. Sankey consisted almost entirely of Meccano parts, but the cone was made of hard wood. It was used on actual work for a considerable time and proved so satisfactory that it was decided to build several further machines in the firm's toolroom, using the Meccano original as the basic design, and reproducing it by ordinary engineering methods.

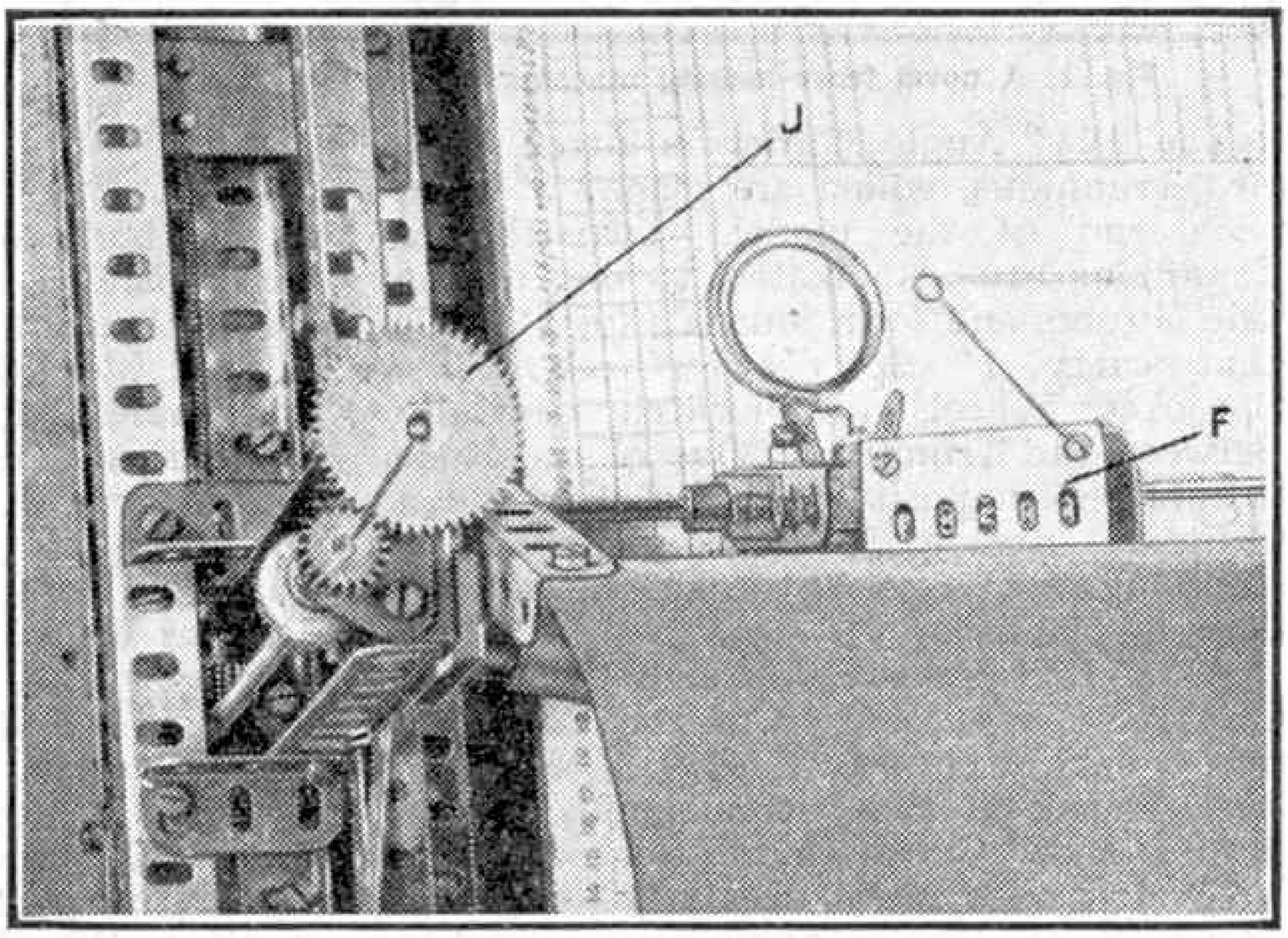


Fig. 4. A plan view of the tracing sight and unit counter. At the left can be seen the indicating dial J referred to in the accompanying article.

New Meccano Models

Fence-Making Machine, Telephone, Saw

THE frame of the model fence-making machine shown in Fig. 1 is constructed as follows. Two pairs of 12½" Angle Girders are each spaced at their ends by two 3½" × 2½" Flanged Plates. The oblong frames so formed are then spaced 4½" apart by 9½" and 5½" Angle Girders as shown in the illustration. Diagonal 3½" bracing Strips are fitted to each end of the structure and a 12½" Angle Girder is bolted in place down the centre of the top of the frame between the end transverse Angle Girders.

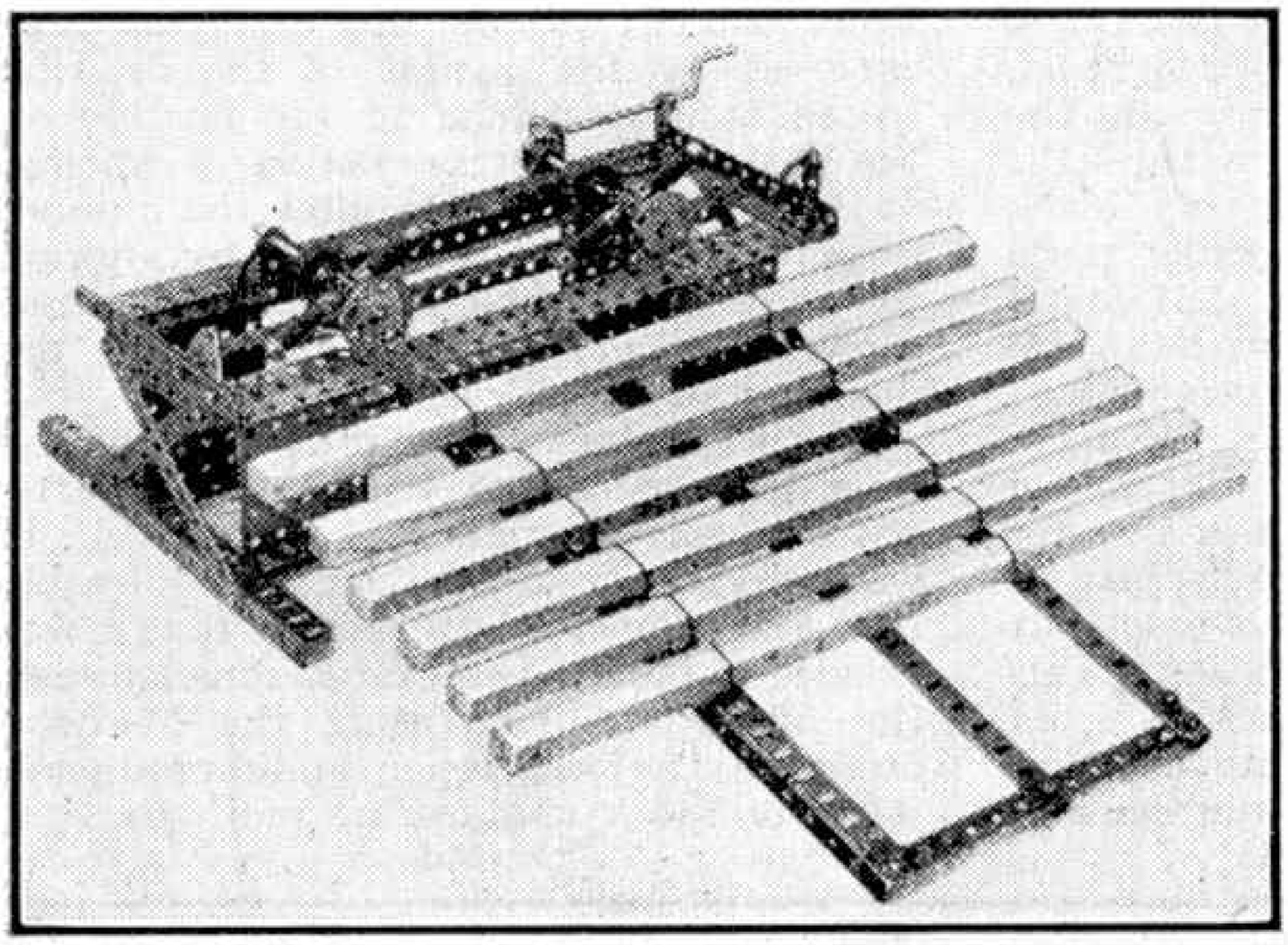


Fig. 1. A novel fence-making machine that really works.

The 12½" Angle Girder is fitted with two Trunnions, which are placed 3" from each end of the model. Two further Trunnions are also bolted to one of the side Girders and form journals for 3" Rods that carry 1" Sprocket Wheels. The Sprocket Wheels are located centrally between the Trunnions. One of the Rods is retained in position by a Collar and a Coupling, and a ⅞" Bevel Gear and a Coupling are used to hold the second Rod in place.

A 3½" Rod is passed through the central transverse bore of each of the Couplings and is held in place by Collars. Collars are also placed on the extreme ends of the Rods. A 3½" Crank Handle on which are a Collar and a Bevel Gear, is journalled in a 1" × 2½" Double Angle Strip bolted to the framework of the model. This Bevel engages the Bevel on the transverse shaft. A Bush Wheel is fixed to the Coupling on each transverse shaft by a 1" Rod. It is important that the 1" Rods should be secured to the Couplings in such a manner that their ends press lightly on the 3½" Rods. Two Corner Brackets are bolted to the ends of the model in the positions shown to form guides for the wood strips when the machine is in motion.

The manner of using the machine is as follows. The projecting ends of the 3½" Rods in the Couplings are wound with fairly strong wire, and the ends of the coils, after being pulled through the Bush Wheels, are twisted tightly together. A piece of wood is then passed through the loop between the twists and the Bush Wheel, and pushed up against the guides. On turning the handle the wires are twisted tightly round the wood. The fencing should then be withdrawn to the required distance from the guides and the operation repeated.

Parts required to build model fence-making machine: 6 of No. 2; 3 of No. 6; 8 of No. 8; 2 of No. 8a; 2 of No. 9; 2 of No. 9b; 2 of No. 16; 2 of No. 16b; 2 of No. 18b; 1 of No. 19s; 2 of No. 24; 2 of No. 30; 72 of No. 37; 30 of No. 38; 1 of No. 46; 4 of No. 53; 10 of No. 59; 2 of No. 63; 15" of No. 94; 2 of No. 96; 2 of No. 103b; 4 of No. 126; 2 of No. 133; 2 of No. 133a.

The body of the telephone shown in Fig. 2 is first constructed and fitted with its mechanism and then it is mounted on a base by means of two Flat Brackets. The guides 1 for the arm are formed from 5½" Strips. The Rod 2, which carries the switch arm, is fitted as shown in Fig. 3 to a 5½" × 2½" Flanged Plate forming the base. A light spring formed by a 1" Rubber Ring 3 fitted over the head of the set screw in a 1" Pulley acts on the Rod. The Rubber Ring is twisted slightly and locked to the base by a ½" × ½" Angle Bracket spaced by three Washers. The Rod 2 is inserted in the centre hole in the 5½" × 1½" Flexible Plate, and carries a Bush Wheel to which two Trunnions and a 2½" Strip are bolted. The Rubber

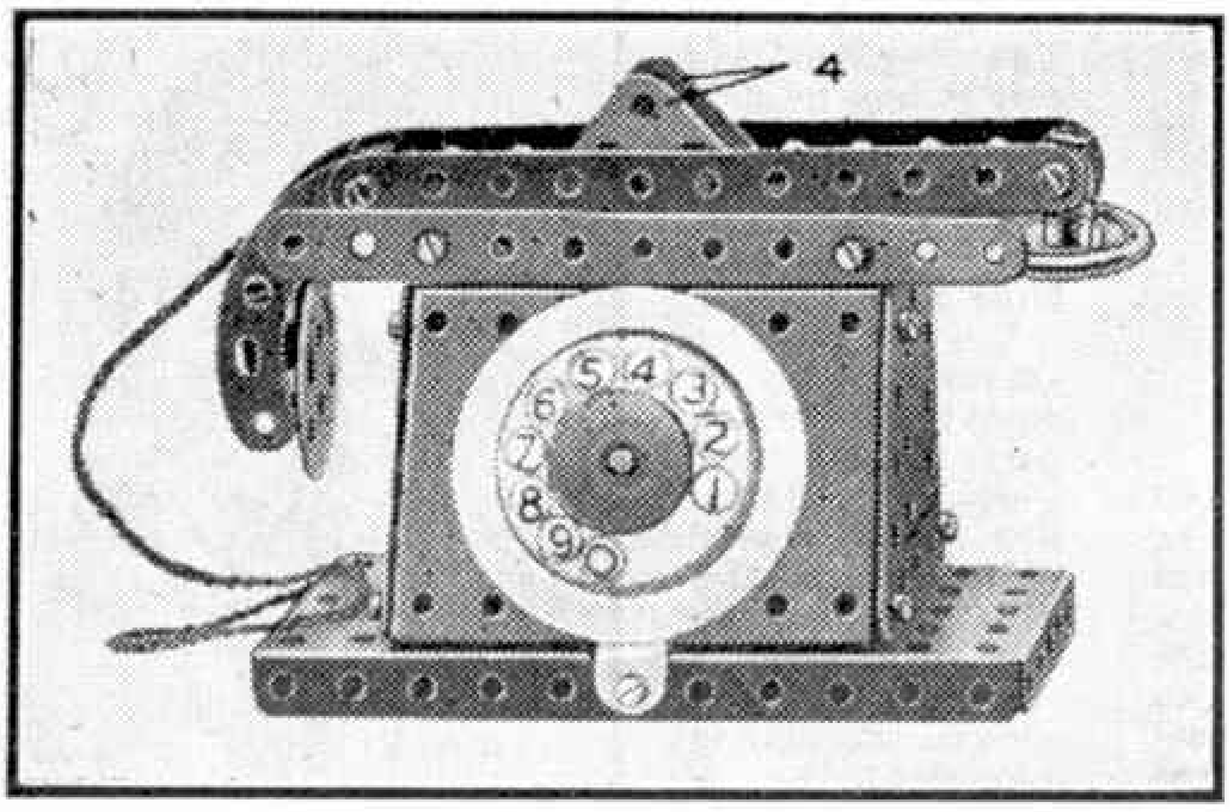


Fig. 2. A simple model of an automatic dialling telephone.

Ring resists any tendency of the switch arm to rotate.

The finger dialling plate consists of a Road Wheel, to the face of which a piece of paper is gummed, the paper being inscribed with the dialling numbers 1 to 9 and 0. The Road Wheel is fitted on the front end of a 2″ Rod which carries a Cord Anchoring Spring 5, the eyelet of which is opened up slightly to take a Driving Band that is also attached to the body. This returns the plate to its normal position after dialling.

The body is now fitted to the base-plate. The arm, as may be seen in Fig. 2, consists of two 5½″ Strips attached to 2½″ Cranked Curved Strips and spaced by ½″ × ½″ Angle Brackets, to which are attached a 1″ Pulley fitted with a Rubber Ring forming the earpiece, and a Flat Trunnion representing the mouthpiece.

Parts required to build model Automatic Telephone: 4 of No. 2; 6 of No. 5; 4 of No. 10; 8 of No. 12; 1 of No. 16; 1 of No. 17; 2 of No. 22; 1 of No. 24; 2 of No. 35; 35 of No. 37a; 34 of No. 37b; 4 of No. 38; 1 of No. 40; 2 of No. 48a; 1 of No. 52; 2 of No. 90a; 2 of No. 111c; 1 of No. 125; 2 of No. 126; 1 of No. 126a; 2 of No. 155a; 1 of No. 176; 1 of No. 186; 1 of No. 187; 2 of No. 188; 1 of No. 189; 2 of No. 190; 1 of No. 191.

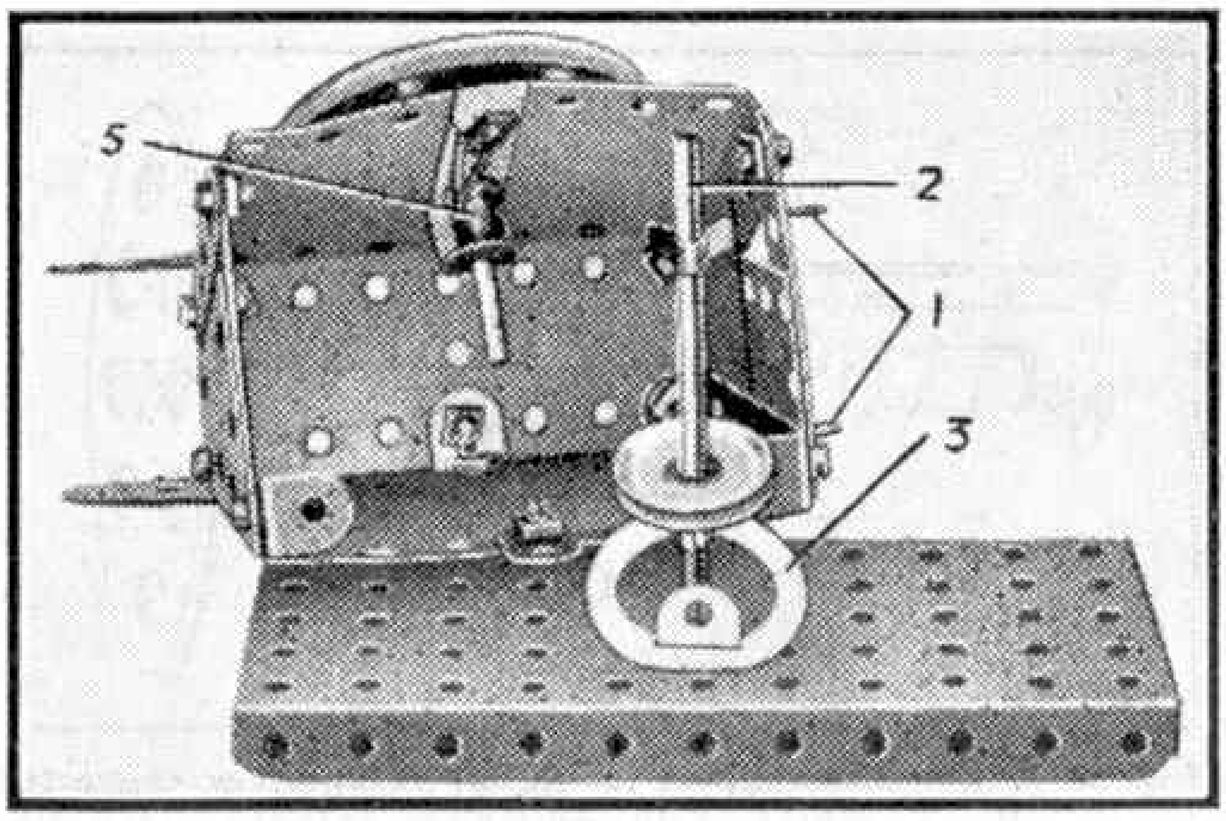


Fig. 3. An underneath view of the telephone shown in Fig. 2.

The 5½″ × 2½″ Flanged Plate that forms the base of the model circular saw shown in Fig. 4 carries two 4½ × ½″ Double Angle Strips, fixed vertically, and a Rod Socket that supports Rod 1. These three uprights carry the worktable. Two 5½″ Angle Girders, only one of which can be seen in the illustration, are fixed to a Large Fork Piece 2, and carry the Plates that form the work-table. The saw spindle 3 is mounted in Flat Trunnions fixed to the frame, and it carries a 1⅛″ Flanged Wheel

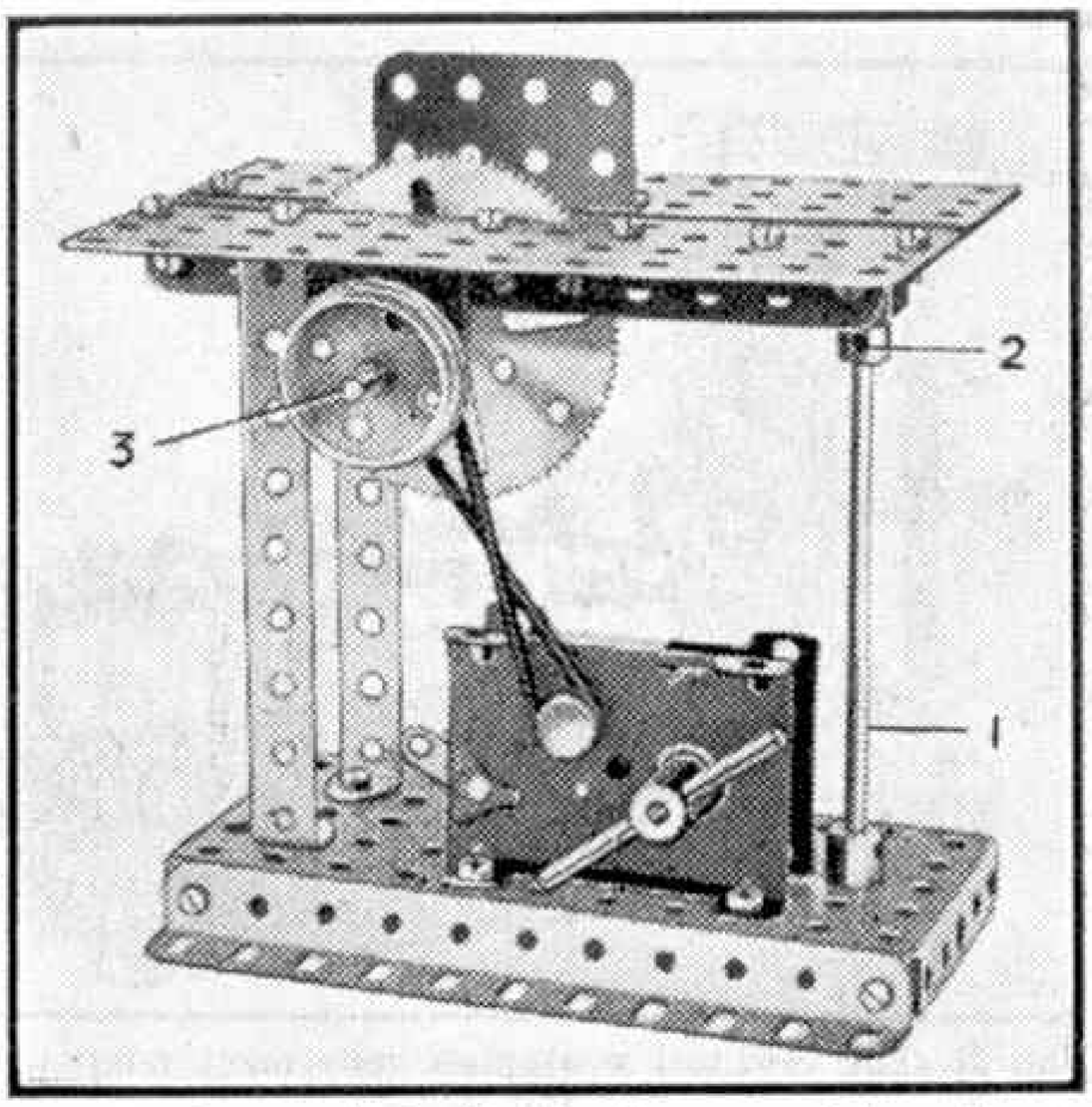


Fig. 4. An easily-built circular saw driven by a Magic Motor.

and a 2½″ diameter Gear Wheel. On the Rod between the Flanged Wheel and the Gear is a ½″ fast Pulley. A guide for the work being sawn is formed by a Girder Bracket bolted to the Plates of the work-table.

The model is driven by a Meccano *Magic* Motor, which is bolted securely to the base Plate of the model in the position indicated. The Pulley on the Motor driving shaft is connected by a Driving Band to the ½″ fast Pulley on the saw spindle.

Parts required to build model Circular Saw: 4 of No. 9; 1 of No. 15b; 1 of No. 16; 1 of No. 20; 1 of No. 23a; 1 of No. 27c; 22 of No. 37; 2 of No. 48c; 1 of No. 52; 4 of No. 73; 1 of No. 116; 1 of No. 161; 1 of No. 179; 2 of Part No. 126a 1 *Magic* Motor.

Among the Model-Builders

By "Spanner"

A MODIFIED SWASHPLATE MOVEMENT

For the benefit of M. Woodward, Cardiff, and others, I am reproducing in Fig. 1 an interesting mechanism for converting rotary motion into direct to and fro motion, this result being obtained in a manner somewhat similar to that produced by the swashplate mechanism, which will be familiar to many Meccano model-builders. The most usual mechanism for producing reciprocating motion of course is the crank and pivoted connecting rod, but a study of the illustration in Fig. 1 will show how this operation can be effected in a quite different manner. A connecting rod operating from a crank

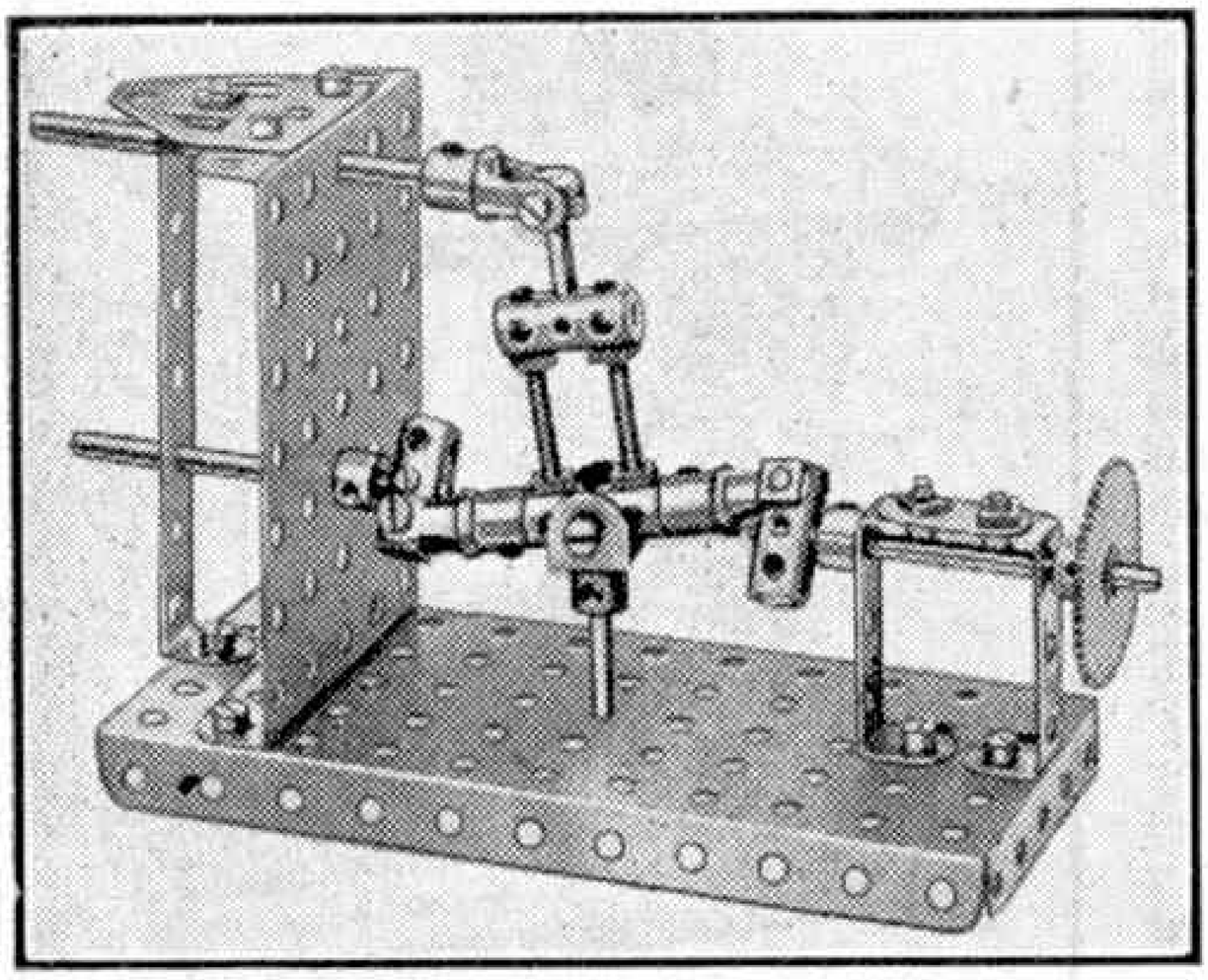


Fig. 1. The modified swashplate movement referred to on this page.

gives a side to side movement besides producing a to and fro thrust, but the device illustrated in Fig. 1, gives a to and fro motion only.

The driving shaft is journalled in two $1\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips connected together by a Flat Bracket and spaced from the Flanged Plate by Washers. The Rod carries a Coupling that is mounted through its centre transverse bore, and the shaft also has a Coupling mounted in this manner. Bearings for the driven Rod are formed from a $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate and a $3\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip, the latter being spaced from the base plate by a Washer.

Small Fork Pieces are attached to the Couplings and connected by a 2" Axle Rod carrying a Coupling. The Rod is free to turn in this Coupling, which is prevented from rotating by a large Fork Piece and Rod. The Bolts passing through the Fork Piece are inserted in the centre tapped holes of the Coupling, and locked in place by nuts. Thus the Coupling is free to pivot on the bolts, and carries two vertical 1" Screwed Rods that are inserted in a second Coupling carrying a 1" Rod in its centre hole.

Rotation of the shaft causes the Rod to rock to and fro, side movement being entirely absent. The final Rod is connected to the 1" Rod by a Swivel Bearing. The "spider" of this is free to slide on the Rod, the movement of which is in an arc centering at the large Fork Piece.

To obtain smoothness of operation working parts should move freely, but excessive play should be avoided as this will cause jerkiness. The Coupling should not be allowed any sliding movement.

A. Reeve, Melton Mowbray, a successful competitor in a recent Meccano Competition.

AN IDEA FOR LOCOMOTIVE BUILDERS

Here is a suggestion sent by Pte. W. T. Marks, now serving with the 15th Australian Infantry Battalion. It is a scheme for a built up buffer unit suitable for large model locomotives and is shown in the drawing reproduced in Fig. 2. The buffer illustrated is simple to build and needs only a few Meccano parts for its construction, while two nuts and bolts suffice to hold the complete unit together.

A $\frac{1}{2}''$ Angle Bracket is bolted to a Chimney Adaptor by its slotted hole, the bolt holding the two parts having a Washer under its head to prevent the shank of the bolt fouling the buffer shaft. The parts are then fixed to the buffer beam by a nut and bolt, which also secure on the inside of the buffer beam a 1" Reversed Angle Bracket, the slotted hole of which allows adjustments to be made to ensure that the buffer shaft is level and slides freely. The buffer head may consist of a Bush Wheel or a 1" Pulley according to the scale of the model, and in the boss of this is gripped a short Axle Rod that forms the buffer shaft. The Rod passes through the Chimney Adaptor and the buffer beam, and carries a Collar, a Compression Spring and a Washer. The inner end of the Rod is supported in the 1" Reversed Angle Bracket as shown.

A USEFUL MOMENTUM MOTOR FOR DRIVING SMALL MODELS

R. H. Hughes, Bristol, is a young Meccano enthusiast who took up the hobby during the war, and like many others has been badly handicapped by the difficulty of obtaining a driving motor for setting

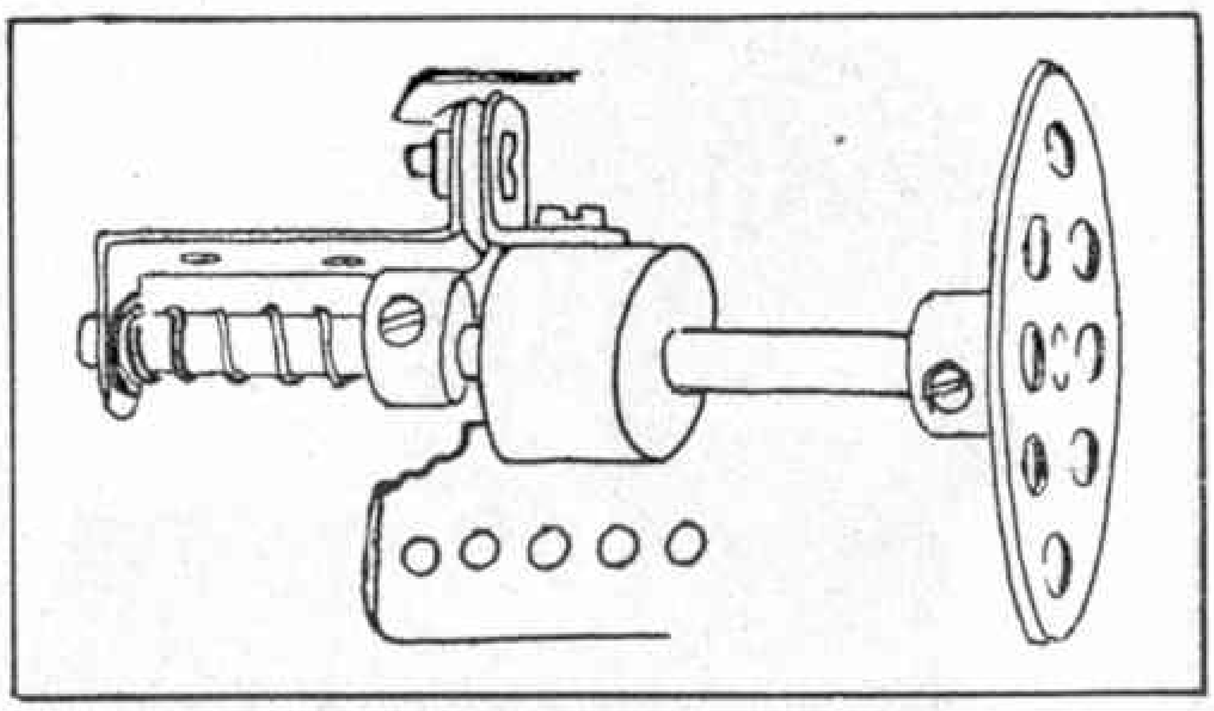


Fig. 2. A design for buffers for model locomotives, suggested by Pte. W. T. Marks, 15th Australian Infantry Battalion, Australia.

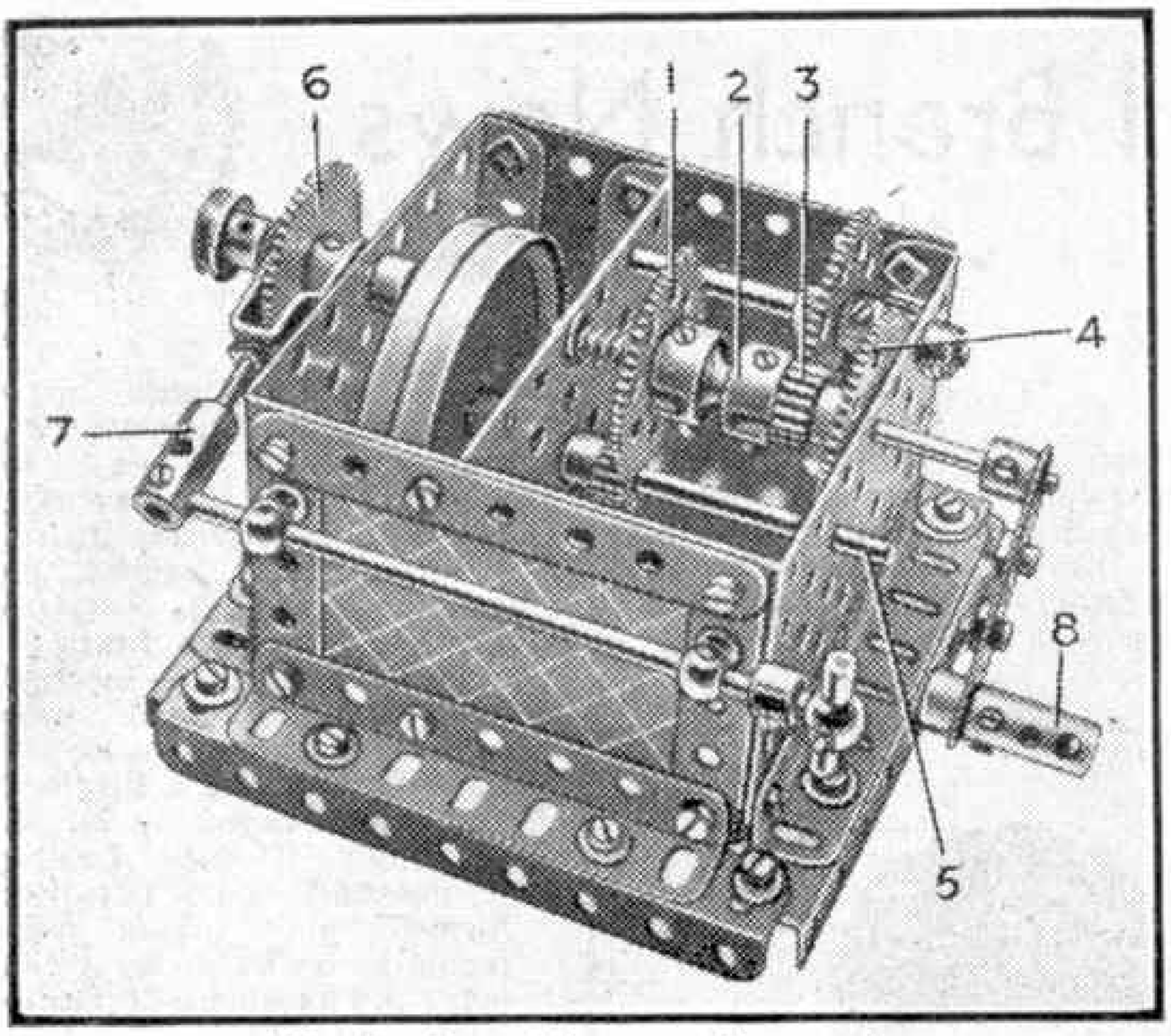


Fig. 3. A useful momentum motor.

his completed models in motion. There is no really satisfactory substitute for a good clockwork or electric motor, but a useful "stop-gap" is a momentum mechanism of the kind shown in Fig. 3. This is suitable for driving only stationary models of a very simple kind, and it consists of a heavy flywheel that can be rotated at high speed by turning a crank handle. The mechanism is provided with two clutches, one of which allows the flywheel shaft to be disconnected from the handle, while the other couples it to the shaft of the model to be driven.

The front and back of the casing consist of $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plates, and its sides of $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates strengthened by $3\frac{1}{2}''$ and $2\frac{1}{2}''$ Strips. It is divided into two portions by another $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate bolted 1" from one end. $3\frac{1}{2}''$ and $4\frac{1}{2}''$ Angle Girders bolted together to form reversed angle girders are bolted along each side of the casing.

A $3\frac{1}{2}''$ Rod is journalled in the centre top holes of gear-box as shown, and it carries at its inner end a Washer and a Compression Spring, a 57-teeth Gear 1, a Socket Coupling 2, a $\frac{1}{2}''$ Pinion 3 and a second 57-teeth Gear 4, arranged on the Rod in that order. The boss of the 57-teeth Gear 1 is gripped in one end of the Socket Coupling, and the other end of the Socket Coupling grips the boss of the $\frac{1}{2}''$ Pinion. The Socket Coupling and the Gears, with the exception of the 57-teeth Gear 4, are free to revolve on the Rod. The outer end of the Rod is fitted with a built-up handle 8.

A $2\frac{1}{2}''$ Rod also is journalled in the sides of the casing as shown. It carries a $\frac{1}{2}''$ Pinion that engages a 57-teeth Gear 4, and a 57-teeth Gear that engages with $\frac{1}{2}''$ Pinion 3.

The 57-teeth Gear 1 meshes with a $\frac{1}{2}''$ Pinion on a $4\frac{1}{2}''$ Rod 5. This Rod also carries a Flywheel, and outside the box a $\frac{3}{4}''$ Pinion. This Pinion meshes with a 50-teeth Gear 6 on a 2" Rod journalled in the sides of the box and in a $2\frac{1}{2}''$ Strip bolted to a Flat Trunnion fixed to the base.

The 2" Rod carries a Cranked Bent Strip, between the arms of which is the 50-teeth Gear 6. This is spaced from the Cranked Bent Strip by two Washers. The Rod has a $\frac{1}{2}''$ fast Pulley on its outer end and a Collar on its inner end. The Cranked Bent Strip is fixed by two Nuts to one end of a $1\frac{1}{2}''$ Screwed Rod, the other end of which is screwed into the bore of a Threaded Coupling 7.

"Home Gadgets" Model-Building Contest

In this competition we are offering prizes for Meccano "gadgets" of any kind that can be put to practical use in the home. A wool-winder that would be welcomed by Mother, a tool rack for Dad or a bicycle carrier for Tom are typical examples of the kind of models that will be suitable as entries. There is considerable scope for useful articles of this kind in every home, and many others will readily suggest themselves to readers.

Only models of home gadgets such as those mentioned are eligible for this competition, and in building them readers may use any size of Outfit or quantity of parts. The contest is open to readers of all ages, at home or abroad, and the prizes will be awarded to the senders of the gadgets considered by the judges to be the most practical and most neatly designed.

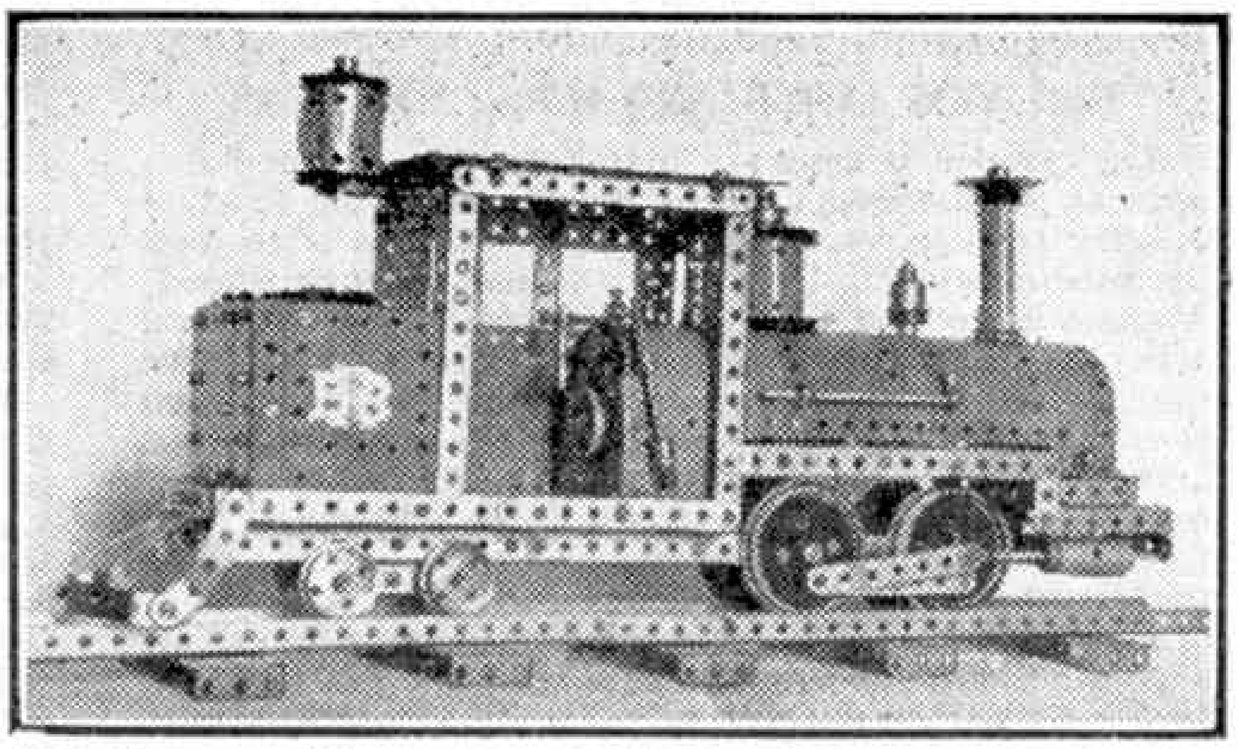
When the model is completed it is only necessary to send either a photograph or a drawing of it to this office. The envelope should be addressed "*Home Gadgets Model-building Competition, Meccano Ltd., Binns Road, Liverpool 13,*" and should be posted to reach Liverpool before 30th March. Entries from competitors living outside the British Isles will be accepted up to 31st July next. This extension will then allow ample time in which to prepare their models and forward their entries.

The following prizes will be awarded for the best models submitted. First, Cheque for £2/2/–. Second, Cheque for £1/1/–. Third, Postal Order for 10/6. There will also be several consolation prizes.

"Most Useful Parts" Contest Results

The Meccano parts that received the highest number of votes in this Contest are as follows: (1) Collar, (2) Face Plate, (3) Bush Wheel, (4) Coupling, (5) Corner Bracket, (6) Girder Bracket. The prizes were awarded to the competitors whose entries forecast this sequence most closely, and were allotted as follows:

1st Prize, Cheque for £2/2/–: J. E. Boddy, Darlington; 2nd, Cheque for £1/1/–: D. E. Ash, Cheam; 3rd, Postal Order for 10/6: C. Morley, Liverpool. Consolation Prizes of 5/–: G. McConnell, Wakefield; J. Leeson, Brigg; H. Burrell, Guildford; J. Williams, Shrewsbury.



This fine model of an early locomotive won a prize for P. R. Wickham, Leicester, in an "M.M." competition.

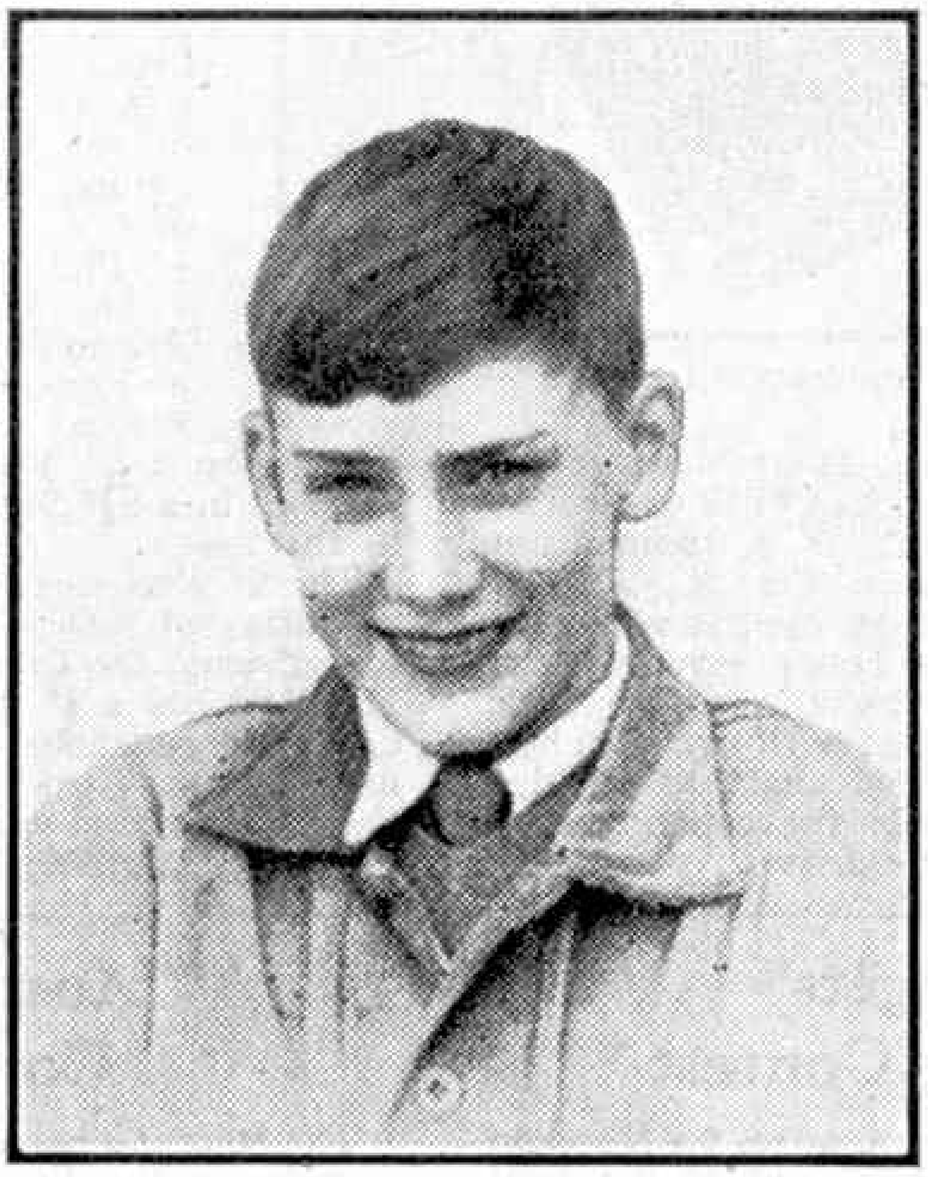
Club and Branch News

WITH THE SECRETARY

A GREAT STEP FORWARD

The increase in enthusiasm that the return of Meccano has brought about is already showing results in the form of a flood of applications for membership of the Guild, from those who have been fortunate enough to become owners of Meccano Outfits in the Christmas season. These are only a beginning, for the number of Outfits available was strictly limited, and as more of these make their appearance there will be further recruits, while the H.R.C. too is sharing in this great step forward. I welcome the new members for both organisations very heartily indeed. I and my staff look forward to helping them to make the most of their hobby, and we trust that they will all keep in touch with us as regularly as possible.

A further pleasing thought is that here are recruits for existing Meccano Clubs, which for so long have been starved of newcomers, and members also for new or revived Clubs. I am being asked by new members for details of their nearest Clubs, and the information I can give, Club and Branch reports in the Magazine, and notices of the proposed formation of new organisations are all helpful in guiding newcomers to the hobby. This makes it all the more important to send in reports and requests regularly. At the moment I am handicapped by lack of space, but I hope that it will not be long before I can expand a little, and so make sure of publishing notes from Clubs and Branches promptly and regularly.



P. Mayo is Secretary of the Barkers Butts Senior Boys' School M.C.; President, Mr. F. G. Howe, Headmaster; Leader, Mr. F. Batten. This fine school Club was affiliated with the Guild in May 1944. The chief feature of its programme is Meccano Model-building, with a weekly competition, and operations on the Club's Hornby Railway are also prominent. Excellent displays of models and railway operations have been given at Exhibitions and Open Days at the School.

FOR NEW GUILD AND H.R.C. MEMBERS

The proper course for members who do not live near an established Club or Branch is to try to start one for themselves. For this the first step is to look up members who live in the same neighbourhood. Anyone interested who does not already know several other members should write to me, so that I can give him the names of others in the same position. Then they can get together and some very active Clubs and Branches should be the result. Once again, let me impress on members that a Club or Branch need not be a large one, with elaborate equipment, to be successful. There is great fun to be obtained at meetings of small organisations, consisting perhaps of only half a dozen members, and for this reason a start should be made with meetings of some kind immediately.

Progress is sure if every member keeps these points in mind and does his utmost on behalf of the Guild and the Hornby Railway Company.

CLUB NOTES

BOSTON M.C.—Model-building continues satisfactorily, and chemical experiments also have been carried out. Members were interested to see "*Fred Everard*," the sailing barge referred to in the November "*M.M.*," in Boston Dock. Other activities include operations on the Club's Hornby Train Layout, and Table Tennis and other games. Club roll: 6. *Secretary:* P. E. Luff, 103, Woodville Road, Boston, Lincs.

PLYMOUTH M.C.—Interesting recent events have included a very successful Parents' Day and a Firework Display arranged by Mr. L. Wakeham, Deputy Leader. A Football Team has been formed, play taking place regularly on Saturday mornings. An excellent Christmas Party was arranged. Club roll: 91. *Secretary:* D. M. Cundy, 10, Whitefield Terrace, Lipsom, Plymouth.

HORNSEA M.C.—Football has been the chief outdoor sport during the Winter months. The Club took part in a Torchlight procession during Hornsea's Thanksgiving Week. Indoors practical electrical work and woodwork have been enjoyed, in addition to a Film Show, and a Lantern Talk by Mr. R. W. Shooter, Leader. Special Meccano constructional work also is being carried out. Club roll: 63. *Secretary:* P. Hobson, 1, Marlborough Avenue, Hornsea.

BRANCH NEWS

LARGS—At the Annual Meeting the rules of the Branch were settled. Members are now grouped into two Sections, "Rovers" and "Rooks." At one meeting younger members were given special instruction and practice in train operation. Each Section holds regular track meetings, Debates are arranged and Games are played. *Secretary:* W. McWhinnie, 29, Barr Crescent, Largs.

GAINSBOROUGH—Rebuilds and alterations have been carried out. The entire track has been overhauled, and additions have been made to it, including a new double junction. Good operations have been carried out with the extended layout, including the running of fine "specials." *Secretary:* F. J. Newman, 26, Birrell Street, Gainsborough.

GIFFNOCK—Fine work is being done at track meetings. Special attention is given to the condition of track and rolling stock, and members are building various accessories. A Library has been started. Railway models of all kinds have been built at home by members and exhibited at meetings. *Secretary:* R. Ogilvie, 20, Huntly Avenue, Giffnock, Renfrewshire.

PERSE SCHOOL (CAMBRIDGE)—An excellent Branch room has been secured and the track laid down in it and thoroughly tested. Operations are now in progress at meetings. *Secretary:* D. Mann, 151, Shelford Road, Trumpington, Cambridge.

More Hornby-Dublo Signalling Schemes

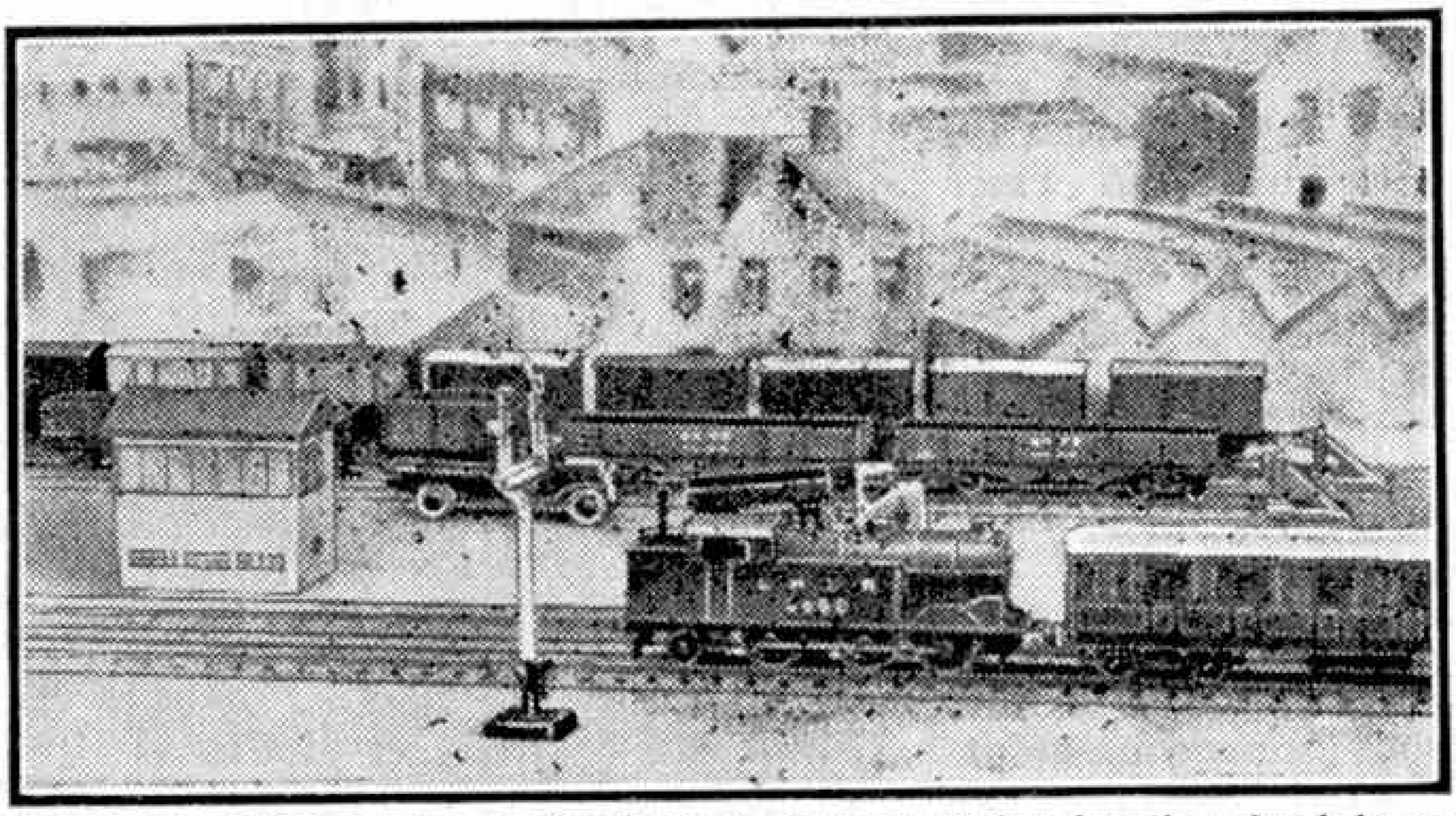
LAST month we dealt very briefly with the uses of various signals of the Hornby-Dublo System, the single arm, double arm and junction types. Now we refer to one or two more items in signalling practice that should prove of interest.

Just as the single-arm "home" signal, the one with the square-ended semaphore, has a corresponding "distant," that is the one with a yellow semaphore having a fishtailed end, so the junction signal appears in two patterns, one home and one distant. We have already referred to the various uses to which the home type junction signal can be put and the accompanying illustration shows it in use. Distant type junction signals can be used as long as there is sufficient space to include them between the junction signal itself and the preceding home signal. On a long main line stretch approaching a turnout controlled by the junction signal the distant type can be used very effectively.

Last month we saw the situation that arises when the section preceding the turnout is a short one. The distant semaphores are then placed below, but on the same post as the home signal in advance; hence the purpose of the double arm signal. Two of these side by side can be employed, if we have them, to control the section approaching the junction. They do not, however, indicate to the driver the direction of the turnout which he is approaching. A real driver, however, would know this from his acquaintance with "the road."

A simple operation that is carried out many times probably in the course of Hornby-Dublo operations is the backing of a train into a siding. Let us suppose that the siding is situated just beyond the station platform, the points being approached in the trailing direction and being protected on the main line by the starting signal. The latter, often known as the "starter," is of the ordinary home pattern, and its function is to allow trains to leave the station. It is as a rule placed just beyond the platform end.

The starter being "clear" our train leaves the station and the next signal encountered is also of the home pattern, and is known as the advanced starting signal. This is placed rather more than a train length beyond the starter itself so that when a train has to set back into the siding it can be halted at a convenient spot before commencing to run back. The advanced starter, therefore, will be at "danger"; so that the train stops while the points, now behind it, are set over to lead into the siding. Before this is done, however, the starting signal at the platform end should be returned to "danger" in order to protect the movement.



The Hornby-Dublo local train hurries up to town; there is a junction ahead, hence the use of the double arm junction signal.

In actual practice the movement back through the points would be controlled by ground signals or discs—our old friend the *"Tommy Dodd"* in fact—placed by the points. This, however, is a refinement not often found in miniature practice so we must be content without it and take our train in when the road is set. The siding will have a starting signal corresponding to the main line one at the platform end; its function is to allow trains to leave the siding so that it should not indicate "clear" until the points are correctly set.

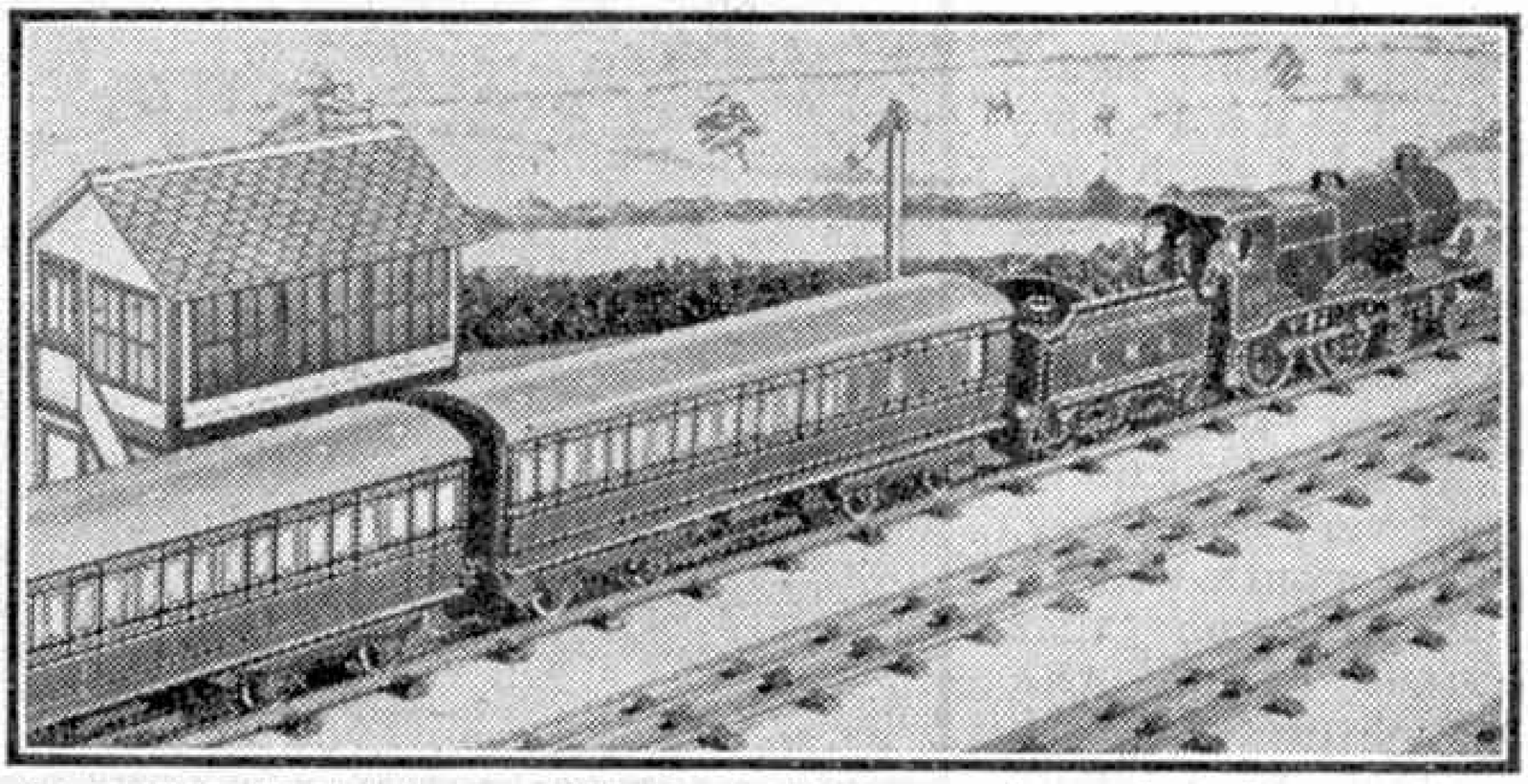
For siding and shunting signals good use can be made of the Dinky Toys Signals, if we have any. These are somewhat smaller than the standard Dublo Signals but they may help us to make the best use of these for main line purposes.

A Hornby Railway in Northern Ireland

A "There and Back" Layout Plan

THE most familiar plan for a miniature railway layout is that which in one form or another incorporates a continuous main line. It has many advantages, and where long runs are desired by the "Operating Department" it forms the only means of satisfying this requirement. The one or perhaps two stations on the circuit have to change their identity in order to keep pace with the train's progress, but those who favour continuous layouts usually find no difficulty about this. Another type of plan, the exact opposite in fact, is the end-to-end kind often favoured out of doors, but difficult to accommodate in most houses nowadays.

An interesting variation is what we may call the "there and back" plan, in which the train leaves one end of the line and ultimately returns to its starting point. This is often used where terminal operation rather than long runs forms the chief interest of the owner of the line. When the terminus is well laid out, some most attractive working can be pursued. Trains can be made up and despatched, then afterwards received again at the arrival platform and sent off on other runs, or disposed of for the time being while other stock is assembled.



An express headed by an E220 Standard Compound speeds on its way down the main line of a Hornby railway.

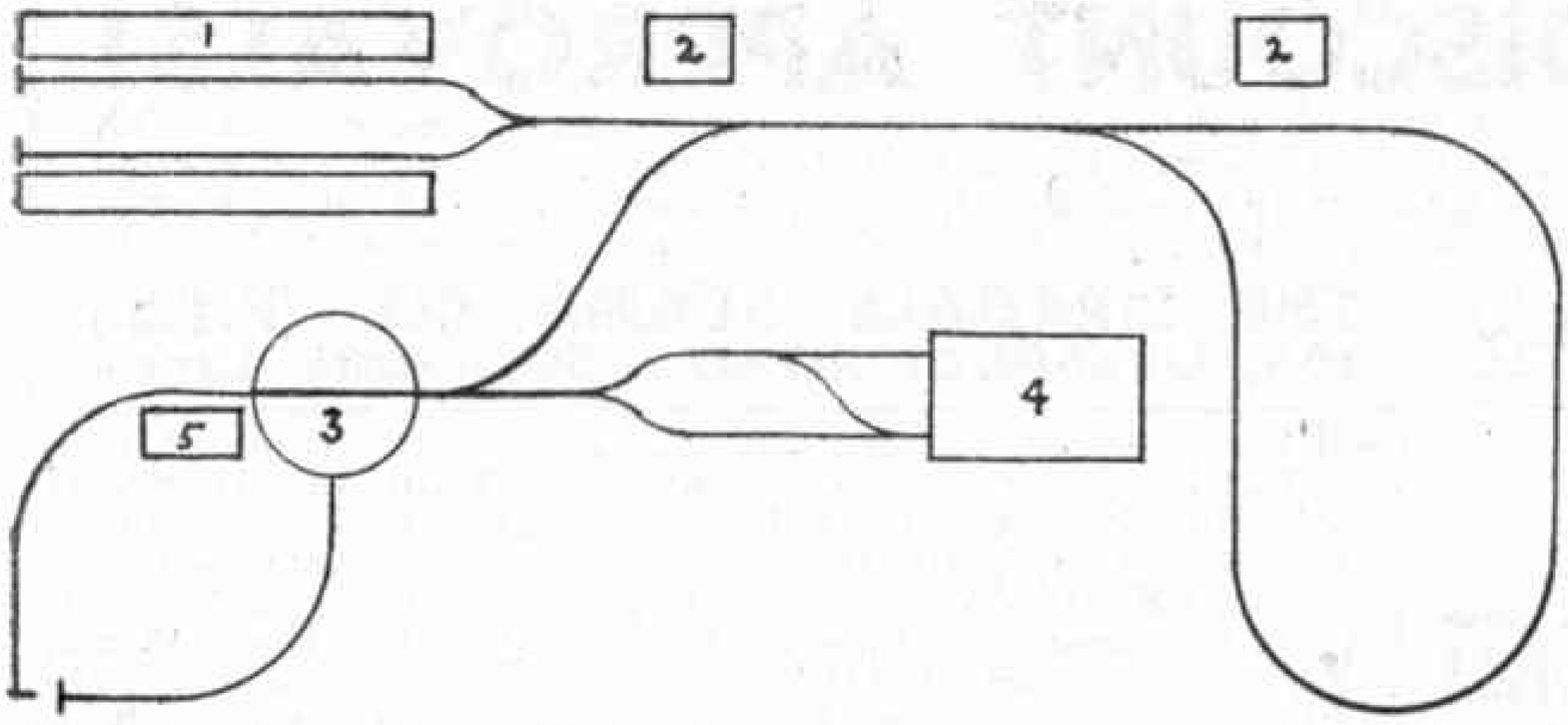
The diagram on the next page shows in simple form the layout plan evolved on these lines by *"M.M."* readers P. Scales and B. Reid, of Enniskillen. The railway is not a permanent one as no room can be allotted for this purpose, and the line is set out and taken up again as required. The straight stretch of the system is laid in a passage, and the loop shown at the right-hand side of the diagram is accommodated in a room opening out from this.

The originators of the line were later joined by another enthusiast, D. Whaley. With three operators the working of the system became easier and more enjoyable. Each then had a separate section under his control; one would take the main or passenger station, another the goods and locomotive yard and turntable, and the third would look after the loop line points, an important job if traffic is to be worked simply and without mishap.

The main station has two tracks that converge by means of parallel points to form a single track main line. Neglecting the yard for the moment, the main layout proceeds without any special feature until the points governing the loop line are encountered. The loop doubles back to rejoin the main line and this forms the means of returning a down train to the terminus. It will be realised that the points have to be operated for each train whichever route is taken, so that with frequent traffic the operator at this place has a busy time.

Variation in the running programme can be introduced by routing certain trains to take the straight road at the loop points, and others to take the curved approach to the loop. This in itself would add still more to the interest of the loop operator's job.

The yard section of the main station run is an important feature. Points outside the station signal cabin lead to the main yard track. In one direction lies the engine shed that is served by two tracks, and alongside one of these is a water tank. The two tracks are connected by crossover points; they are not strictly necessary, but with several engines on and about the shed premises such points are useful



The layout of B. Reid and P. Scales of Enniskillen, Northern Ireland, referred to in this article. The numbered items are: 1, Hornby No. 1 station; 2, signal cabin; 3, turntable; 4, engine shed; 5, goods depot.

in providing an alternative way in and out of the shed. In the opposite direction lies a turntable, and from this two further tracks radiate. One serves the goods depot and the other is useful for accommodating wagons.

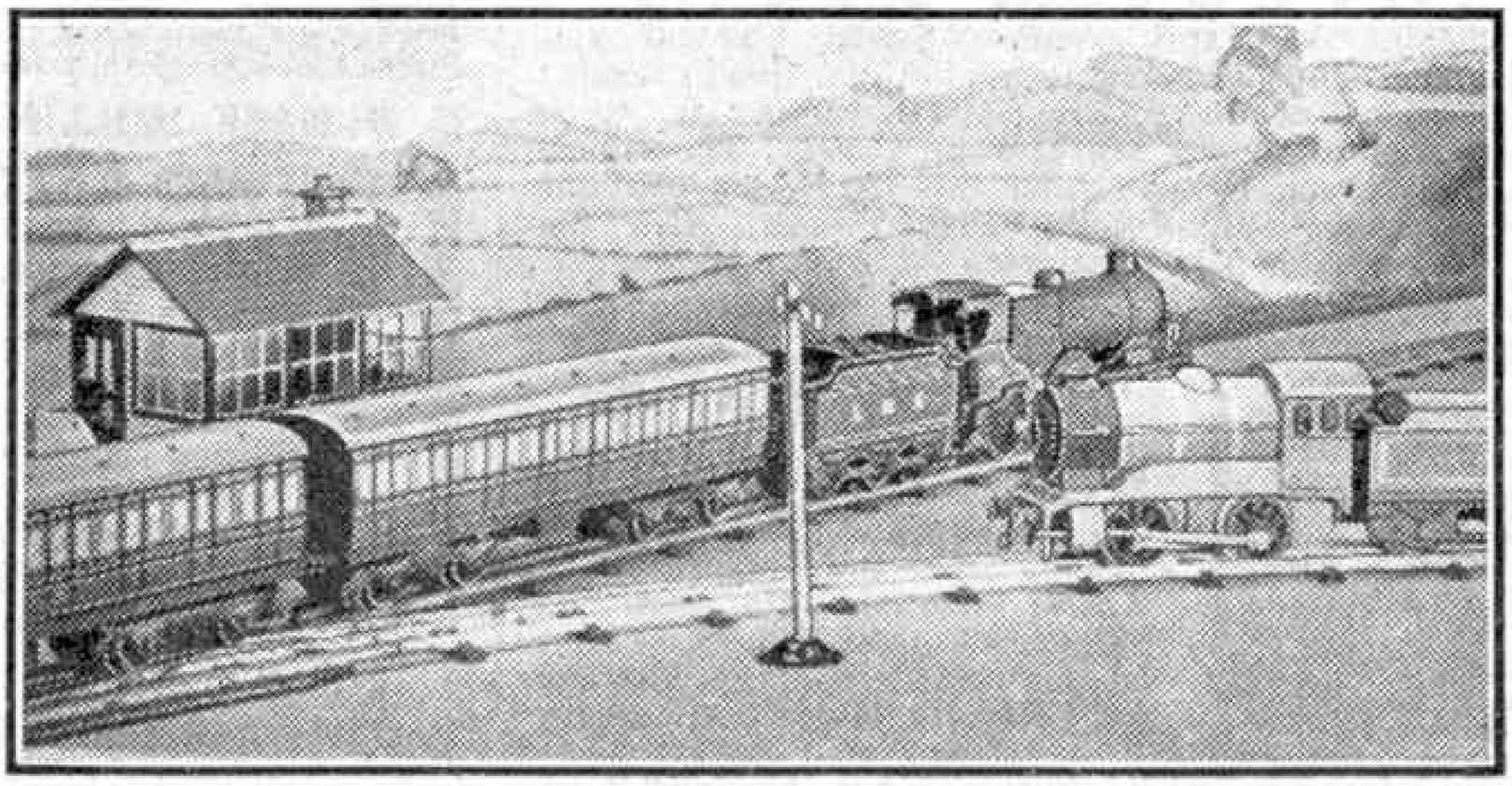
With two tracks available in the station, one can be kept for departure purposes, while the other can deal with arrivals. The station itself is a composite affair; the departure platform, which is the upper one in the diagram, is formed by a Hornby No. 1 Station, while the opposite or arrival side consists of an island platform made of wood at home. Home construction has provided a good many of the other lineside effects, such as a goods platform, warehouses and the locomotive shed.

At present an engine that has taken its train from the station down the main line, round the loop and back, has to be held at the buffer stops until the train is drawn away by another engine. In fact what is known as the "turnover" method of locomotive working must be used. Where there are not many locomotives available this may at times lead to delays. It would therefore be an improvement, given the equipment, to introduce another set of parallel points at the terminal or buffer stop end of the platform. These would bring the platform lines together again, and with one or two lengths of rail added to the single track thus formed the arrangement would provide the means of getting an incoming engine round its train. With tank engines in use—there are two of these employed on the present layout—the engine could be re-coupled to the other end of the train, and set off on another journey. Before departure the head lamps and tail lamps should be changed over to suit the new journey.

Where it is preferred to turn the locomotives round at the end of each journey the turntable could be used. A point to remember here, however, is that the largest locomotive in the Hornby series that can be accommodated on the No. 2 pattern Turntable is the No. 2 Special Tank, the largest tender engine being the No. 1 Special. If bigger engines such as the No. 2 Specials are used another method of turning would have to be followed. After disposing of its train on arrival at the station, one of these bigger engines could be run tender first down the main line, round the loop, and back. It will then be the right way round to begin a fresh journey with the engine leading.

Engines in use on the line are all clockwork models. Express trains are worked by a Hornby No. 3 "Riviera" locomotive and the general mixed traffic work is handled by a No. 1 Special Tank. There is also a 0–4–0 tank, which is specially useful for work in the goods yard.

The line is signalled in a satisfactory manner without any complicated arrangements. Some of the buildings, in particular the signal cabins, are fitted with electric light.



"Waiting at the Junction box." A branch line train waits while the express clears the points.

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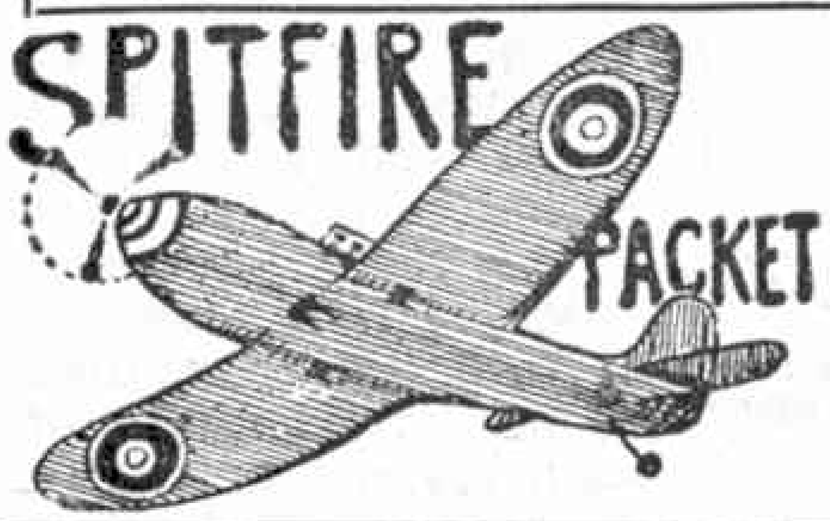

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For other Stamp Advertisements see also pages 80 and vii.

Stamp Collecting

Stamps in the South Seas

By F. Riley, B.Sc.

IN our Empire stamp tour we have already visited Pitcairn Island and Fiji in the South Sea. We could stay in this part of the world for a considerable time, as in it there are many interesting groups of islands under the British flag. To the north of Fiji there are the Gilbert and Ellice Islands, almost on the Equator. The stamp history of these islands did not really begin until 1911, before which Australian stamps had been used.

In that year a special Gilbert and Ellice Protectorate stamp appeared, a Fiji issue with the names of the islands overprinted. This had a portrait of King Edward VII, and was of the well-known "tablet" variety, the value appearing in a hexagonal tablet placed under the portrait.

This provisional issue had only a short life, for very soon a definite stamp appeared, and this was interesting because it illustrated the Pandanus pine tree, a palm that is a special feature of the group. Later there was a return to tablet stamps, with a portrait of King George V, which were followed by Silver Jubilee and Coronation issues of the usual type for colonies and Protectorates, and then the islands burst into pictorials with a splendid issue of 12 values, all in two colours.

We cannot stay here to go through this splendid series in detail. Those illustrated on this page are typical and will serve to show what the general issue is like. The ½d. stamp shows the frigate bird, and the 1½d. stamp a canoe crossing a reef, a typical South Sea Island subject. The 1/- value pictures the cantilever jetty on Ocean Island from which phosphate is shipped, as described in Mr. Rebbeck's article on bulk phosphate carriers in last month's "*M.M.*"

From Gilbert and Ellice Islands we may next visit the Tonga group, east of Fiji. These were named Friendly Islands by Captain Cook, who was well received there during his Pacific explorations. There are 150 of the islands, some of them of coral and the rest volcanic in origin, and on the latter there are still active volcanoes. Falcon Island, one of the group, is indeed a real jack-in-the-box, for it disappears and turns up again at intervals, volcanic action being the cause of its strange behaviour.

In Tonga there is a tortoise

that is reputed to have been left by Captain Cook himself, so that it must now be of venerable age. This historic tortoise seems to have impressed itself on Tongans, for to it the characteristic turtle watermark of many Tongan stamps seems to owe its origin. The watermark has now been changed to the familiar Crown and Script C.A. commonly used for colonial printings.

Like other South Sea island countries, Tonga has issued some very fine pictorial stamps, but the earliest, which appeared as long ago as 1886, carried a portrait of King George Tubou I, the "Grand Old Man of the Pacific," who brought peace to the islands after years of civil war. Soon after his death his country became a British Protectorate and to-day it is ruled over by the great king's granddaughter, Salote Tubou. The first pictorials, with the turtle watermark, came in 1897, and included representations of a prehistoric trilithon and the famous South Sea Islands bread fruit tree. These stamps are illustrated on this page. The bread fruit tree design was later used for a stamp issued in 1899 to celebrate the wedding of the King to Queen Lavinia, and to mark the occasion it was overprinted "T—L," these letters being the initials of the names of the king and queen. The date "*1 June 1899*" also was included in the overprint.

The present queen of Tonga succeeded in 1918, and since that time the stamps issued have carried her portrait. One of these portrait stamps was issued to celebrate the Jubilee on her accession and was shown in the March 1944 '*M.M.*'

A curiosity of Tonga's stamp story that may be new to some of our readers is the Tin Can Mail. This originated from Niua-Fo'ou, one of the most remote of the Tongan islands. It has a harbour, but this is so seldom useable, because of hurricanes and other difficulties, that ships cannot readily collect any mail from the island. Many years ago efforts were made to introduce a rocket post, but this was not successful, and eventually arrangements were made to pack the mail in a tin can that was carried out to passing ships by native swimmers, who also collected incoming mail packed in the same way. What was intended as a convenience for a white trader and the few people on the island grew enormously, for passengers in ships collecting the mail eagerly seized upon the opportunity for gathering interesting souvenirs, and sent letters ashore for posting. The stamp used was the current Tongan with the portrait of Queen Salote, and the envelopes were covered with postmarks and cachets certifying them as genuine Tin Can Mail.

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Queensland ..	9	18	South Rhodesia	8	15
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Write to-day and be in time for this month's prizes.

THE GEM STAMP CO.,
1729, LONDON ROAD, LEIGH-ON-SEA, ESSEX

For other Stamp Advertisements see also pages 78 and vii.

Stamp Gossip

and Notes on New Issues

By F. E. Metcalfe

ONE thing to be said about stamp collecting is that whatever country, or group of countries, one collects, there is always something doing. As a rule collectors of modern foreigns get the most fun for their money as far as new stamps are concerned, but just now those who go in for British Colonials of the present reign are having almost as much excitement as anybody else. As usual, we shall have to pay some attention this month to foreign new issues, but we could fill several pages about the philatelic happenings in our own Empire.

The first stamp to be illustrated this month is the modest 3c. U.S.A. issue in honour of Alfred E. Smith, formerly Governor of New York. We mentioned this stamp last month and said then that its emission would cause some controversy. Well, this is not the place to discuss American politics, and we will content ourselves by saying that the stamp has caused a bit of a rumpus.

As most readers will know, Holland has for several years brought out a "Child Welfare" set of stamps. Something joyful was generally depicted, but the stamp we are illustrating this month, which belongs to the latest set to be issued, shows a very different state of affairs, for instead of the "Laughing Child" by Franz Hals, which came out in 1937, or some other similarly happy subject, we get the sorrowful face of a tiny youngster. This speaks all too eloquently of the trouble in Europe to-day.

While on the question of trouble in Europe, the French stamp illustrated, one of a set of four issued to show the damage French cities suffered during the war, gives some idea of the devastation wrought in the fine old town of Caen. Lest we should imagine that we have got all the troubles in the world to bear, it doesn't do us any harm to be reminded now and again that others are probably worse off than we are.

During the past few years Finland has brought out many interesting stamps, and they have the merit of being attractive as well as cheap. We are illustrating one recently emitted in honour of the great composer Jean Sibelius, a musician who probably is appreciated more in Great Britain than in any other country in the world, with the exception of his own.

The last but not least of the stamps shown this month is one of the "Victory" stamps issued by South Africa, and overprinted for Swaziland. As most readers will know, South Africa has emitted the values 1d., 2d., and 3d. in bi-lingual pairs and these have been overprinted for use in South West Africa, Basutoland, Bechuanaland and Swaziland. By the time these lines appear in print those of S.A. and S.W.A. will be obsolete, but those for the colonies are to remain on sale until the end of March. That isn't a long time, so interested collectors had better get cracking if they haven't bought their sets yet.

Before the war London was the centre of the world for the buying and selling of postage stamps, and some of the finest collections in existence were held in this country. When the war broke out the two leading London stamp auctioneers opened offices in New York, with the idea of selling British collections to American buyers and thus obtaining very necessary dollars to help the war effort, but things didn't work out exactly as planned. Prices prevailing over here for most foreign stamps were higher than could be obtained "over there," so naturally collectors were not disposed to get rid of their collections in the U.S.A. At least not very many; but as the firms concerned were the best in London, which of course means the best in the world, they were soon able to get more than their share of American collections to sell through their auctions, and a seal has now been placed on their success by the announcement that one of them is to handle the great collection of the late President Roosevelt. Well done the British stamp auctioneers!

A collector asks a very pertinent question regarding the Jap overprinted British Colonial stamps of the Straits Settlements that are now pouring over from the Far East The question is whether these stamps are entitled to a place in our colonial collections. Well, any collector is entitled to put just what stamps he chooses in his collection, but these Jap "overprints" are certainly not British Colonial stamps, for when Japan occupied our eastern possessions these ceased for a time to be the parts of the British Empire, and as soon as the Japs were kicked out these stamps ceased to be valid for postage, so they cannot be considered British Empire stamps. They are very interesting, but let nobody try to collect them all, for there are said to be about 200 different ones for Malaya alone.

Now for our monthly tip. The first 1½d. and 3d. stamps of Swaziland issued during the present reign, S.G. Nos. 30 and 32, are catalogued 4d. and 6d. respectively, mint. They are worth as many shillings as they are quoted pence.

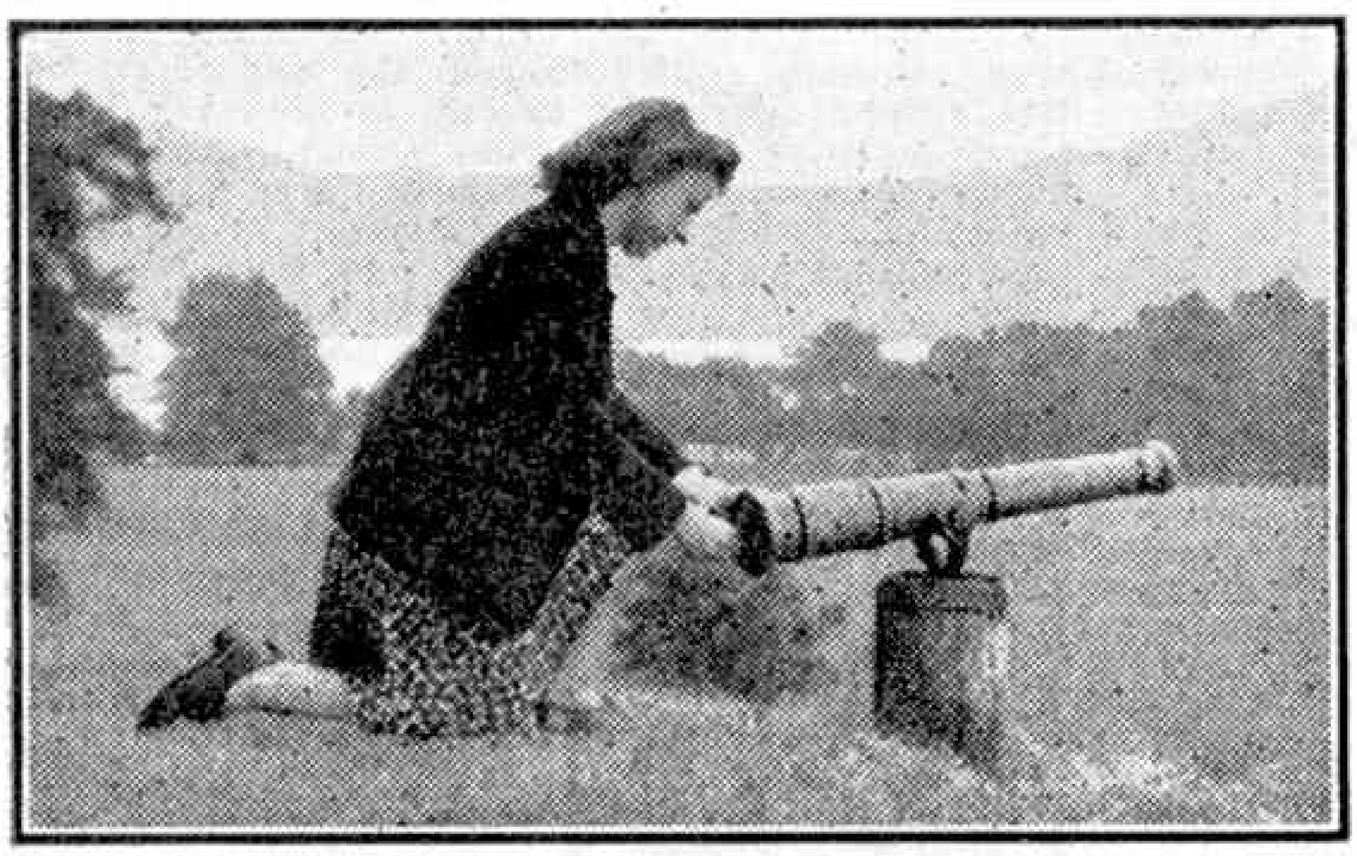
A collector remarked the other day to the writer that even if philatelic scribes did know any good things, which he very much doubted, they always kept them to themselves. Last year, when Barbados S.G. No. 249 was catalogued at 6d. and sold for less than 2/6, it was given here as a very good stamp. It now sells at 25/-.

From Our Readers

This page is reserved for articles from our readers. Contributions not exceeding 500 words in length are invited on any subject of which the writer has special knowledge or experience. These should be written neatly on one side of the paper only, and should be accompanied if possible by original photographs for use as illustrations. Articles published will be paid for. Statements in articles submitted are accepted as being sent in good faith, but the Editor takes no responsibility for their accuracy.

THE LOCH NESS GALLEY

The Loch Ness Galley was an armed transport, which up to a little over 100 years ago used to bring up supplies from Inverness for the garrison of Fort Augustus. The vessel, which was cutter rigged and



One of the muzzle-loading swivel guns from the Loch Ness Galley, now in the grounds of Invermoriston House. Photograph by C. R. Rowson, Liverpool.

of about 30 tons register, was built in 1725 on the orders of General George Wade, the famous Highland roadmaker, as the land route alongside Loch Ness was vulnerable to attack by the Highlanders.

The first few years of the galley's existence were uneventful, but in 1745, when Bonnie Prince Charlie's forces captured Fort Augustus, the boat was used to convey prisoners and their baggage to Inverness under escort. When peace came once again to the Highlands the galley was back on its old job of keeping the fort supplied, and among those who trod its deck were Dr. Samuel Johnson and his friend Boswell.

With the opening of the Caledonian Canal in 1819, allowing sea-going vessels to reach the fresh waters of Loch Ness, the galley was no longer needed, and it was broken up the following year. The stone jetty, alongside which the vessel used to berth, is still to be seen at Fort Augustus, as is the home of the galley's captains, whilst at Invermoriston House, about eight miles away on the side of the loch, are several of the old brass swivel guns, or "patteroes," as they were called, that were mounted on the galley. As recently as the coronation of our present king these muzzle-loaders were fired, but the explosion blew one of them off its mounting.

CYRIL R. ROWSON (Liverpool).

MALTA'S HARBOUR BOATS

Ask anybody who has at some time or other visited Malta what was the first thing that impressed him on his arrival there. Invariably he will tell you that he was from the first attracted and fascinated by the peculiarly shaped boats for hire that ply about the island's harbours.

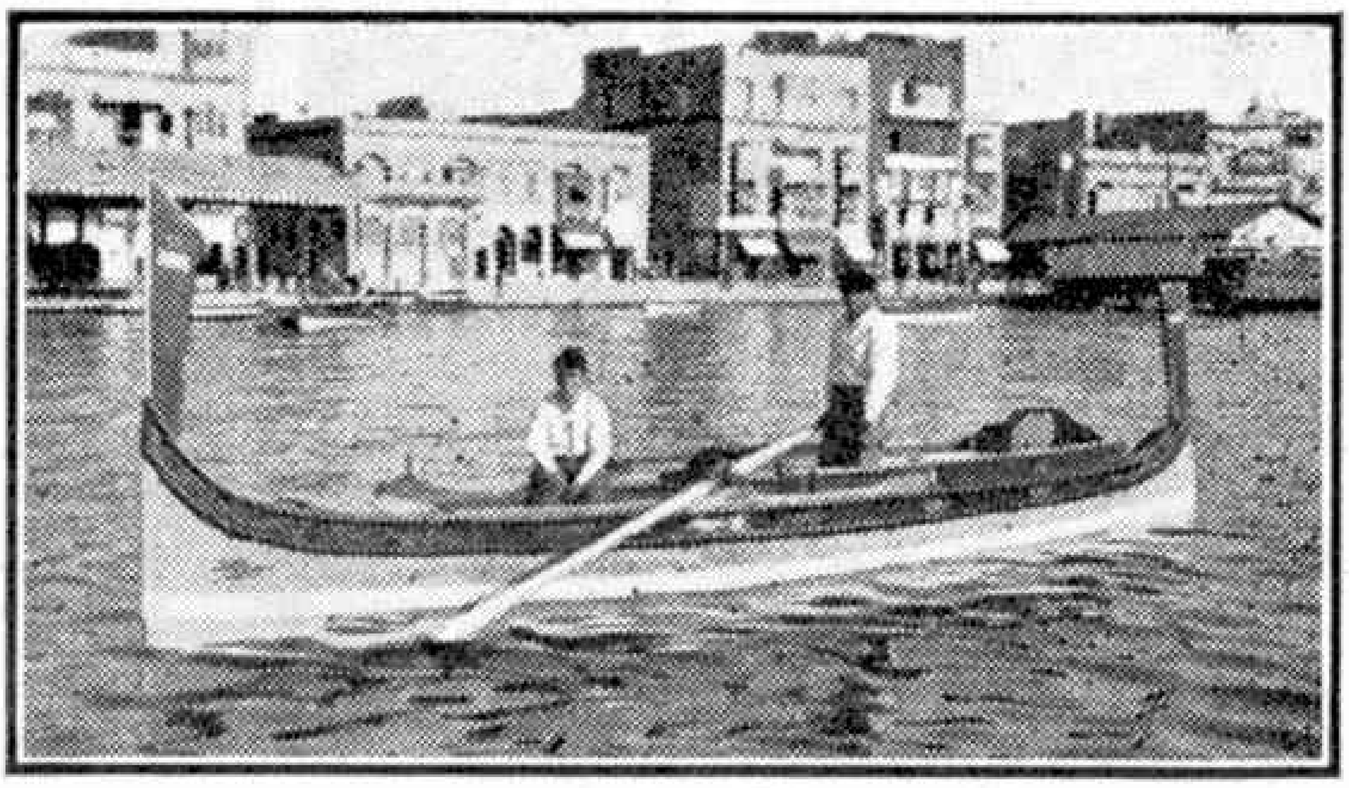
These boats, called dghajsas, pronounced "daisas," are of the rowing class. They are long, slim and light, are easily managed and can carry as many as 8 to 12 fully grown persons. Their flat bottoms enable them to penetrate into the many shallow places around the harbours, and they need no special pier or quay for landing their loads or passengers.

When one takes their cargo into consideration, one finds that the speed of the boats is almost incredible. Some of the very light ones can easily overtake a mechanically-propelled boat. This perhaps is partly due to their long oars. Another advantage they possess is that they seldom, if ever, overturn.

It is an everyday experience in Malta to see these dghajsas scurrying here and there in the Grand Harbour, Malta's finest and most important harbour, skimming across the water or bobbing up and down to form a very attractive picture. Many a time I have seen visitors to Malta remain for hours on end staring at the multitude of these rowing boats, receiving passengers from ships in harbour, riding majestically towards the shore, transferring their human load on to dry land and finally returning to the ships in quest of more passengers. Their variegated colours, pronounced curves and long, thin and seemingly weak oars blend together to produce a picture that a painter always yearns for and seldom finds. The slenderness of the oars makes them look very fragile, but their length allows the boatmen to exert a great leverage and so to make the boats speedy. This adds to the fine impression the dghajsas produce.

It can safely be said that the dghajsa is to Malta what the gondola is to Venice. These two boats have many things in common. They are both long, picturesque, majestic in their motion and pleasant to ride in, and each can almost be considered as the emblem of its home.

V. G. DIMECH (Malta, G.C.).



Dghajsas in Valetta Harbour, Malta G.C. Photograph by V. G. Dimech, Valetta.

Competitions! Open To All Readers

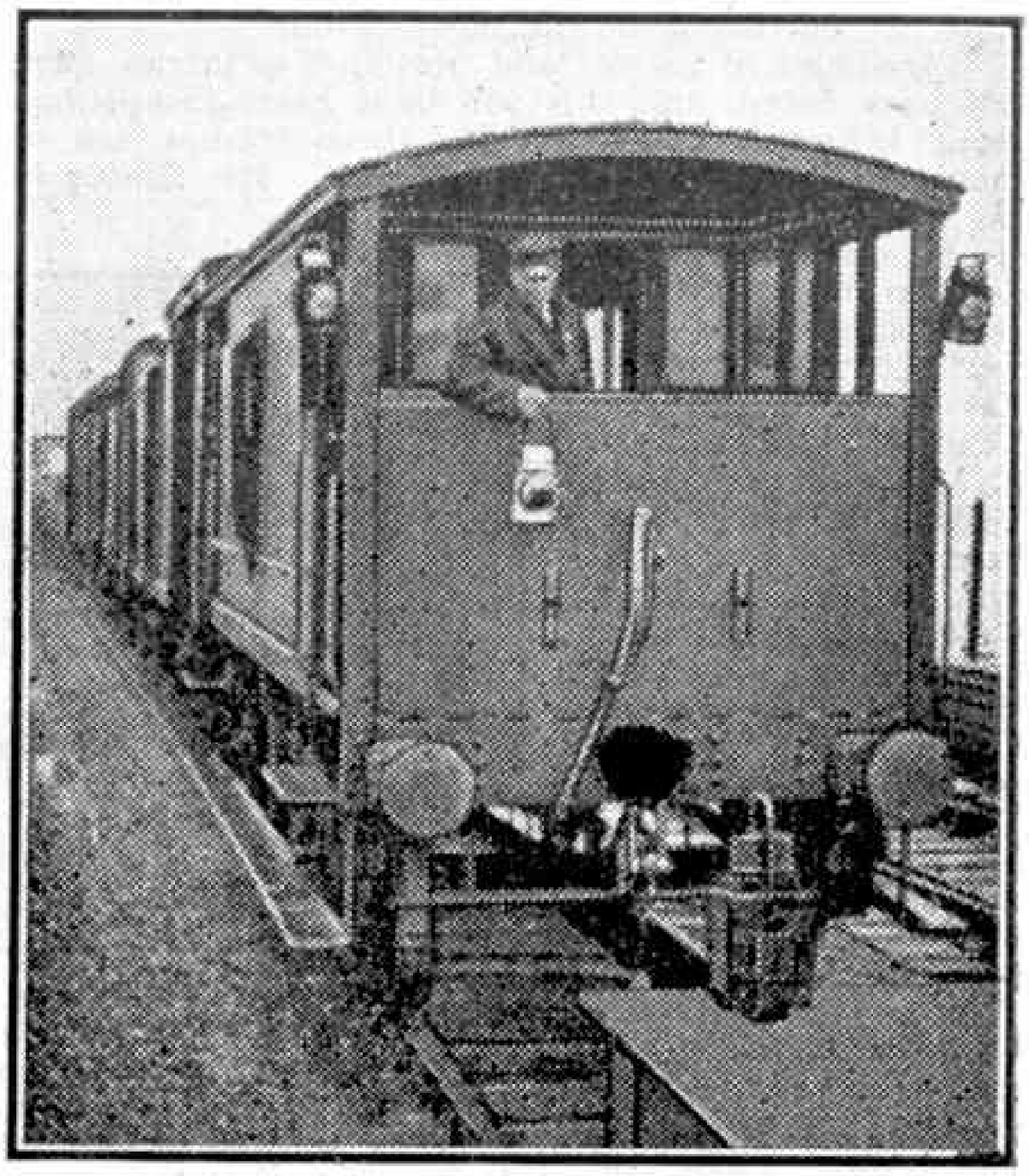
Do You Know . . . . . ?

Whenever railway or model railway enthusiasts "get together," at an H.R.C. Branch meeting, for instance, there is always a certain amount of talk on the latest developments in real or miniature railway practice. *"Do you know . . . . . ?"* is is often succeeded by *"Do you remember . . . . . ?"* and so the exchange of information and reminiscence goes on. It is often surprising to note what odd scraps of information come to light, and here is a "Do you know?" competition that has arisen in this way.

The contest takes the form of a series of questions on railway subjects to which competitors should supply the answers. The accompanying illustration provides a clue to Question 1, but we are not going to tell you the answer! A word of warning. Treat the questions with care; they are not all as easy as they look.

1. The tail lamp is at times temporarily removed from a train on the run. When does this occur?
2. What is Britain's longest railway tunnel?
3. Which is the London terminus where the trains are in the roof?
4. Name the electric railway that is jointly L.M.S. and L.N.E.R.?
5. Which British railway first built a 4–6–2 or "Pacific" locomotive? What was the engine's name?
6. A boat express, steam hauled, runs on an all-electric route. What is the train and which company runs it?
7. What is a "fitted" freight train?
8. What was the last British single-driver locomotive to remain in traffic and on what route was it employed?
9. What is meant by "track circuiting?"
10. What British railway company has no water troughs?

As usual there will be two sections, for Home and Overseas readers respectively, and in each there will be prizes of 21/-, 15/- and 10/6 for the best entries in order of merit, with consolation prizes for other deserving efforts. Where there is a tie the judges will base their decisions on neatness and originality in presentation.



Entries must be addressed *"February Railway Contest, Meccano Magazine, Binns Road, Liverpool 13,"* and must be posted to reach this office on or before 30th March. Overseas closing date: 30th September.

"Go As You Please"

This month we are allowing readers to choose their own competition! We are doing this by arranging a *"Go As You Please"* contest. The two previous competitions of this type that have been arranged were both very successful, each producing many interesting and novel entries; and it is clear that readers welcome the opportunity that such a competition gives them of submitting something out of the usual line of *"M.M."* contests.

The original idea of *"Go As You Please"* was to give readers no excuse for failing to send in an entry. They could not say that they were "not good at that sort of thing," for the simple reason that they were asked to do something at which they were good. Practically any serious effort will be accepted as an entry. It is impossible to mention every type here, but we might suggest that those who draw or paint can show us what they are capable of, and those who write can send in an original essay or story, or even verse! Puzzles also would form suitable entries, while model-builders and those who follow hobbies of any kind, usual or unusual, can base interesting entries on them.

Readers submitting specimens of their own production in this contest should pack them carefully and enclose a stamped addressed wrapper for their return if they wish them to be sent back. Bulky specimens must *not* be sent; instead photographs or drawings, with descriptions, must suffice.

Competitors should note that two types of subjects are excluded from this competition. These are photographs and Meccano models, both of which are provided for in other contests announced month by month in the Magazine.

There will be separate sections for Home and Overseas readers respectively, and in each prizes of 21/-, 15/- and 10/6 will be awarded for the most original and meritorious entries. Entries should have the names and addresses of competitors written clearly on them, and should be addressed *"February Go As You Please Contest, Meccano Magazine, Binns Road, Liverpool 13."* Closing dates: Home Section, 30th March; Overseas Section, 30th September.

February Photographic Contest

This month's photographic contest is the 2nd of our 1946 series, and in it, as usual, prizes are offered for the best photograph of any kind submitted. There are two conditions—1, that the photograph must have been taken by the competitor, and 2, that on the back of each print must be stated exactly what the photograph represents. A fancy title may be added if the entrant desires.

Entries will be divided into two sections, A for readers aged 16 and over, and B for those under 16. They should be addressed: *"February Photo. Contest, Meccano Magazine, Binns Road, Liverpool 13."* There will be separate sections for Overseas readers.

In each section prizes of 15/- and 7/6 will be awarded. Closing dates: Home Section, 28th February; Overseas Section, 31st August.

NEW STAMP CATALOGUES

By F. E. Metcalfe

About the most important event in the average stamp collector's calendar is the appearance of a new "Cat." and, again to the average collector in this country as well as the rest of the Empire, the "Cat." means Gibbons. The latest "Simplified," which has only recently appeared, will be no exception. Catalogues cost quite a lot to-day, as does everything else. The price of the "Simplified" is 12/6 plus postage, so collectors expect a pretty nice book for their money and it can be said at once that they are getting it in the new edition.

War issues of enemy and occupied countries have not been listed, and this will be a great disappointment to many collectors, for these stamps are so much in the fashion at the moment. The Editor in his preface states that it is still illegal to deal in these stamps, but since that was written the situation has changed, for the stamps are now allowed into Great Britain by barter, and many dealers are selling more of these particular issues than even British Colonials, though collectors of the latter stamps are probably wiser.

Another shortcoming is the omission of many prices of modern stamps. The Editor's expressed reason for this is that Stanley Gibbons had been unable to purchase stocks of them at the time of writing. This is disappointing, for it is precisely to find out what stamps are worth, not necessarily to buy them from any particular stamp dealer, that many will buy the catalogue. It is to be hoped that this tendency to leave out prices will be rectified in future editions.

The price of the Catalogue is 12/6, or 13/1 post free direct from Stanley Gibbons Ltd. (Simp. Cat. Order), 37, Southampton Street, London W.C.2. If ordered direct from Stanley Gibbons Ltd. a gummed addressed label should be enclosed.

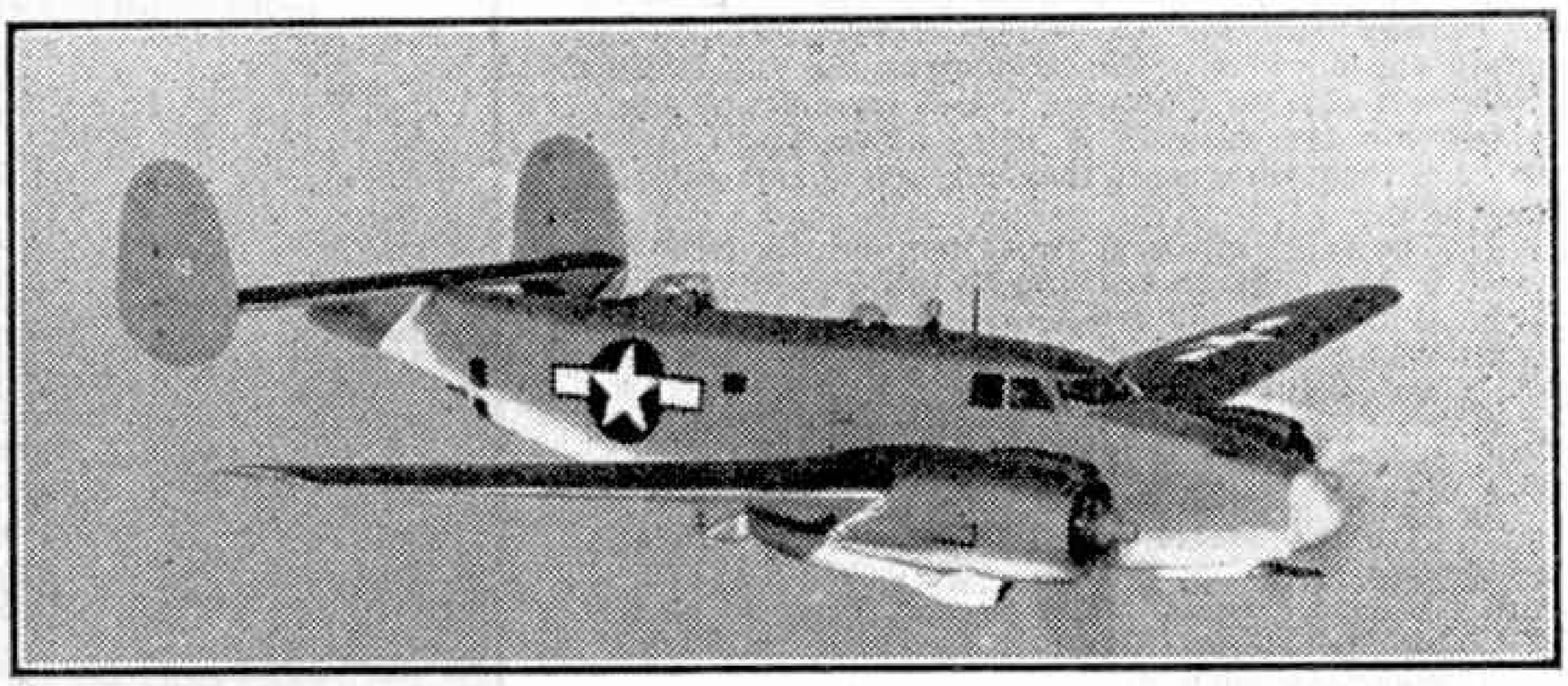
A second catalogue just to hand is the "*Reliant*." This is devoted entirely to British Empire stamps and is published at 6/-. Though only a "paper-back," it has 1,000 illustrations, and all stamps are priced. It is a fairly good reflection of current values, but like Gibbons' "Simplified" does not give perforation varieties; nevertheless this 6th edition will be found useful to collectors of stamps on simplified lines.

"The Olympian"—(*Continued from page 52*)

The Bitter Root Mountains involve another climb, this time to 4,170 ft., and at Avery, just beyond, the first electrified section of 440 miles comes to an end. Here too watches must be put back an hour, a change that has to be made twice in the journey, which covers three time zones, Central, Mountain and Pacific. The running is now downhill, chiefly through rich country, until mountains again become visible ahead. These are of the Cascade Range, crowned by Mt. Rainier, 14,526 ft. high, which dominates Tacoma, one of the termini of the Pacific Northwest. But the train has to be hauled over a summit 2,564 ft. high before reaching its destination, and for this last section electricity generated by the mountain streams is again called into play.

Snoqualmie Tunnel, which pierces the Cascades at the railway's highest point here, is nearly 2¾ miles long. The view from the rear of the train after leaving the Tunnel is inspiring. Glaciers have carved the western slopes of the Cascades into interlacing canyons, and there are forests on every side. The lookout station of a Forest Ranger high up on a rocky pinnacle is seen. From this the watcher has a bird's-eye view of the forests, and day and night he looks out for wisps of smoke that give warning of fire.

And so through the Cascades the "*Olympian*" comes to the Northwest Pacific, to Seattle and Tacoma. Seattle is a great city of 375,000 people, the gateway to Alaska and one of the world's great ports; Tacoma is smaller. Neither port is yet a century old. They stand in a wonderland of mountains and forests, with National Parks and other delightful recreation places within easy reach, and both are becoming increasingly important industrially.



Lockheed PV-2 "Harpoon" medium bombers were used with great effect by the U.S. Navy in the war against Japan. The armament of the "Harpoon" includes 10 .50 calibre machine-guns, and the machine can carry a full-size 1,800 lb. torpedo and eight rockets, four under each wing. It has a speed of over 300 m.p.h. and a range of well over 2,000 miles. Photograph by courtesy of Lockheed Aircraft Corporation, U.S.A.

COMPETITION RESULTS

HOME SECTION

August "Photographic" Contest.—1st Prizes, Section A: R. Atkins, Eccles; Section B: S. J. Field, Drayton, Middx.. 2nd Prizes, Section A: B. Chulindra, Wadebridge; Section B: G. Epps, Brighton. Consolation Prizes: A. L. Yettram, Dublin; B. Buckroyd, Sheffield; H. Briercliffe, Letchworth; F. G. Reynolds, Sidcup.

September "Locomotive" Contest.—G. Wilsher, Cricklewood; 2nd Prize: C. D. Chick, Port Talbot; 3rd Prize: A. Heathcote, Leicester. Consolation Prizes: A. Youngs, West Bridgford; B. Grahl, Liverpool; P. Skinner, Porthcawl.

October "Photographic" Contest.—1st Prizes, Section A: J. S. Cotton, Blackpool; Section B: R. L. Morris, Builth Wells. 2nd Prizes, Section A: J. H. Taylor, Aberdeen; Section B: J. A. Fitchett, Bolton. Consolation Prizes: Rachael Hogg, Balham, London S.W.12; R. Wrigley, Clitheroe; J. Lees, The College, Worksop.

OVERSEAS SECTION

January "Cover Voting" Contest.—1st Prize: L. Trevarthen, Te-Awamatu, N.Z.; 2nd Prize: D. Smith, Bathurst, S.A.; 3rd Prize: M. Smith, Riversdale-Gore, N.Z. Consolation Prize: G. Myburgh, Claremont, S.A.

January "Railway Quiz" Contest.—1st Prize: G. Thompson, Sydney; 2nd Prize: I. T. G. Johnstone, Wellington, N.Z.; 3rd Prize: F. S. Whyte, Toronto, Canada. Consolation Prize: G. Stokes, Port Elizabeth, S.A.

January "Photographic" Contest.—1st Prizes, Section A: F. R. Woodward, Melbourne; Section B: J. Lapira, Malta, G.C. 2nd Prizes, Section A: W. F. Smith, Cape Town; Section B: R. A. S. Greene, Vancouver. Consolation Prize: R. Wilson, Rondebosch, S.A.

Fireside Fun

"I'd like to know what I am best fitted for. Should I go to see a palmist or a mind reader."

"Oh, a palmist, of course. You know you've got a palm."

* * * *

"Why have you stopped the exercise, Cassidy?"
"If you plaze, Sir, Oi'm free wheeling."

* * * *

"To what family does the whale belong?"
"Don't know. No family in our neighbourhood has one."

* * * *

"Did you hear about the burglar who broke into the cheese warehouse?"
"No. What did he get?"
"He got every scent in the place."

* * * *

'I fell and my head hit the piano."
"Did you hurt yourself much?"
"Oh, no. I hit the soft pedal."

* * * *

Visitor: "If your mother gave you a large apple and a little one, and told you to share with your brother, which would you give him?"
Johnny: "Do you mean my big brother or my little one?"

* * * *

"You paid far too much for that gold ring, you know."
"I don't think so. Nobody can cheat me. I know my onions."
"Perhaps so, but you don't know your carats."

* * * *

Cavalry recruit, at first riding practice: "I don't like the look of this horse's head."
Sergeant: "Now don't get worried. You'll soon get over that."

* * * *

"Hullo, is that the teacher. Well, my son will be unable to attend school to-day."
"Who is that speaking?"
"My father, miss."

* * * *

"How can we tell these two horses apart, Blimp?"
"I think we should measure their heights, Blump. Here's a tape measure."
"Right. Now wait a minute. Yes, I've got it now. The black one is six inches higher than the white one."
"Good. Now we can always tell which we have."

* * * *

THIS MONTH'S HOWLER

"Gravity was found by Isaac Walton, and if there wasn't any we should all fly away."

BRAIN TEASERS
WHERE ARE THEY?

Certain things are always associated with certain countries, for instance the White House with the United States and the Zuider Zee with Holland. Here are the names of 12 countries, and in each case, some characteristic feature of one of the 12 is associated with it.

New Zealand, the Golden Horn; Egypt, the Veldt; Spain, Phœnix Park; Mongolia, Sugarloaf Rock; Greece, the Plains of Abraham; United States, Granite City; Turkey, the Golden Gate; South Africa, the Pyramids; Eire, the Gobi Desert; Brazil, the Parthenon; Canada, the Alhambra; Scotland, Mt. Cook.

But this list is terribly mixed up. Can you straighten it out? P.N.

* * * *

NUMBERS AGAIN!

Now let us try something with numbers in it. In a wood one fifth of the trees are oak, one quarter elm, and one third ash. All the rest are poplar and there are 104 of them. How many elms are there? B.I.N.

* * * *

YOU SHOULD KNOW THESE

After readers have tested their thinking powers to the full with the last problem they will welcome an easy missing letter puzzle. Here are the names of six very well known things, familiar to all of us, but each consonant is represented only by the letter X:

xoxax; xxaxxixixe; xaxexxax; xeixa;
xoxax xxox; and xooxex.

The puzzle is to find the consonants and so give the names of the six well known objects.

* * * *

Driving home his point.

* * * *

SOLUTIONS TO LAST MONTH'S PUZZLES

The sharp worker of our first puzzle is a grindstone, and there must be few readers who did not discover this.

The various series in our second puzzle are completed by the following: 40; 677 Sixpences; Lt.-Col. J.; Decagon; Green Year.

The three names required in our third puzzle are MECCANO, DINKY TOYS and HORNBY TRAINS.

The clock that is in full working order, yet stands still, appears to have puzzled readers considerably, for at the time of writing not a single correct answer had been received. A clock that is going would always show the same time to us if we were moving away from it with the speed of light. Then we run away from it at exactly the same speed as the light waves from it come back to us, so that we are always on the same wave, that conveying the time at which we begin our headlong flight through space. Exactly the same result will follow if the clock is whirled away from us at the speed of light, yet to anyone riding with the clock this will appear perfectly normal.

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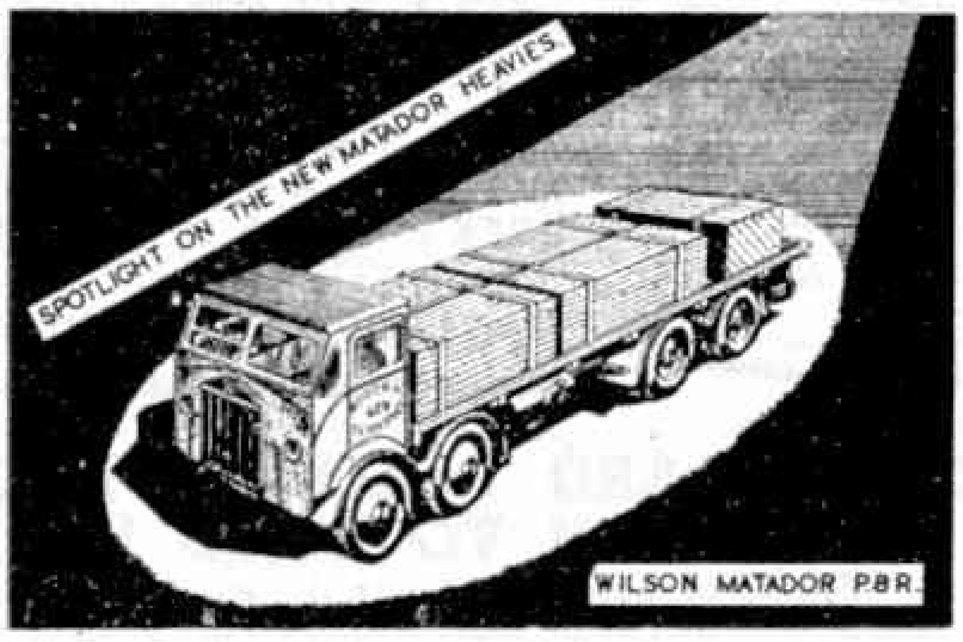

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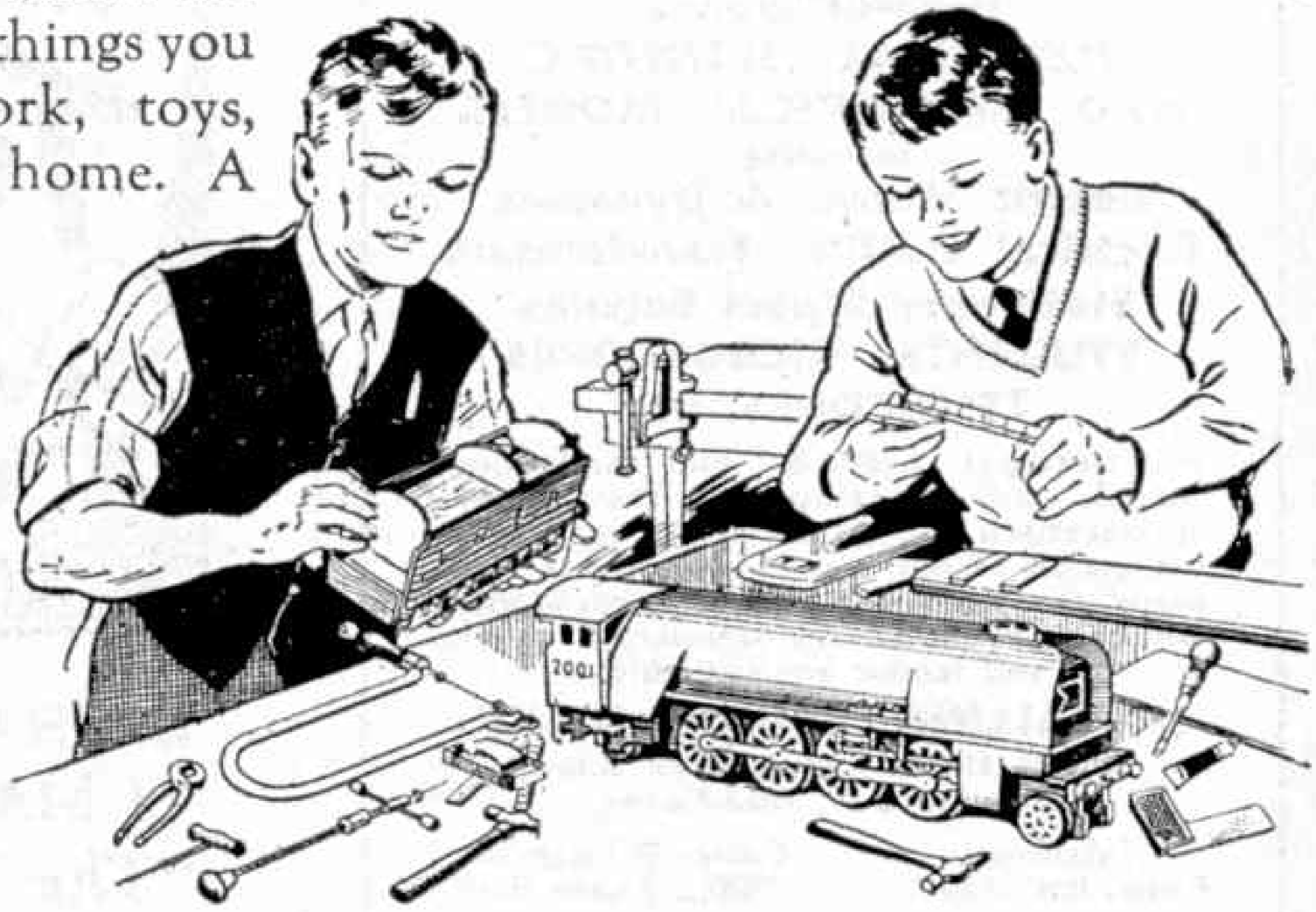

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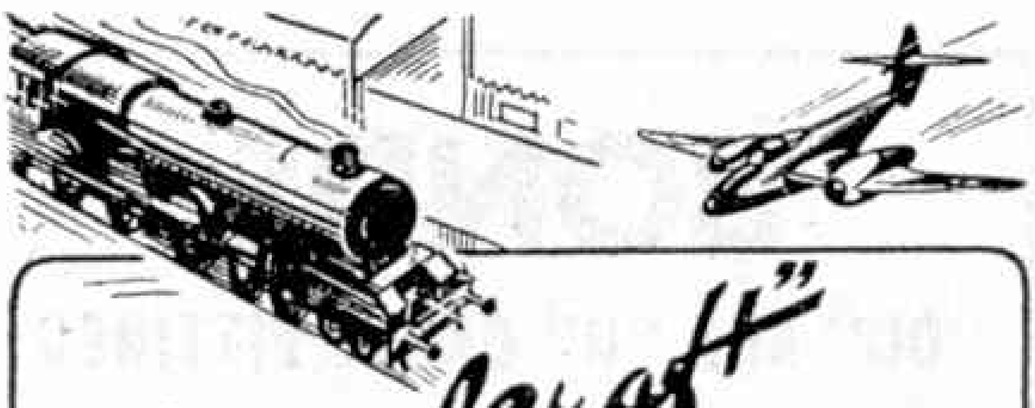

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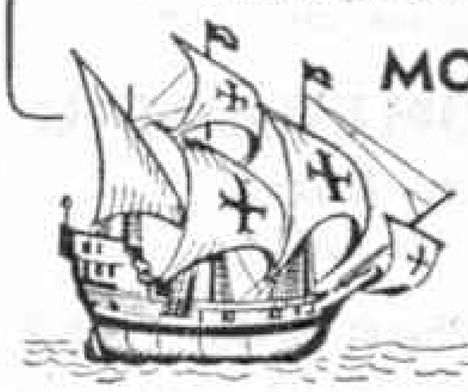

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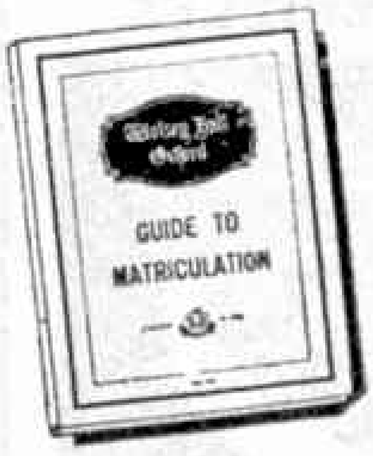

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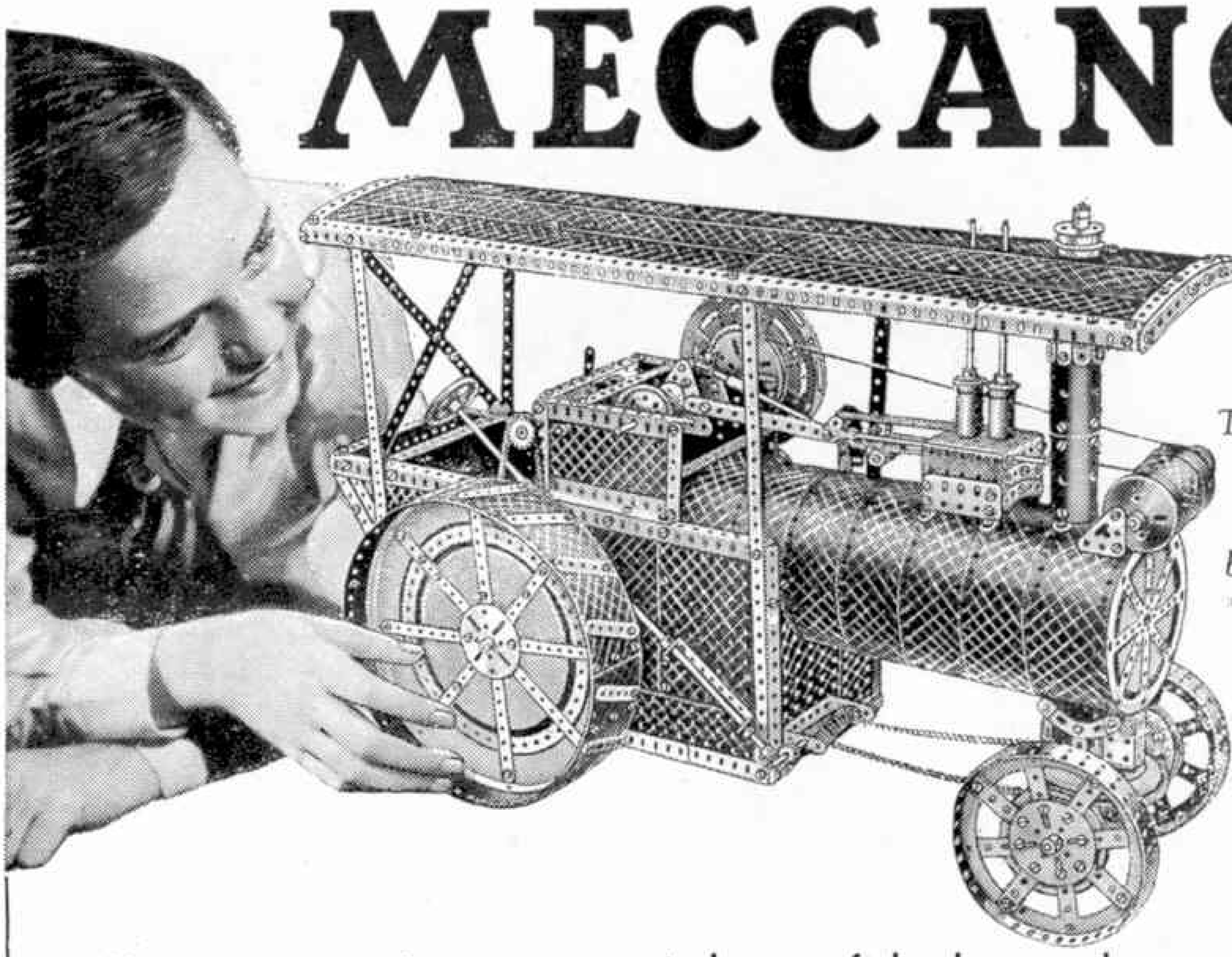

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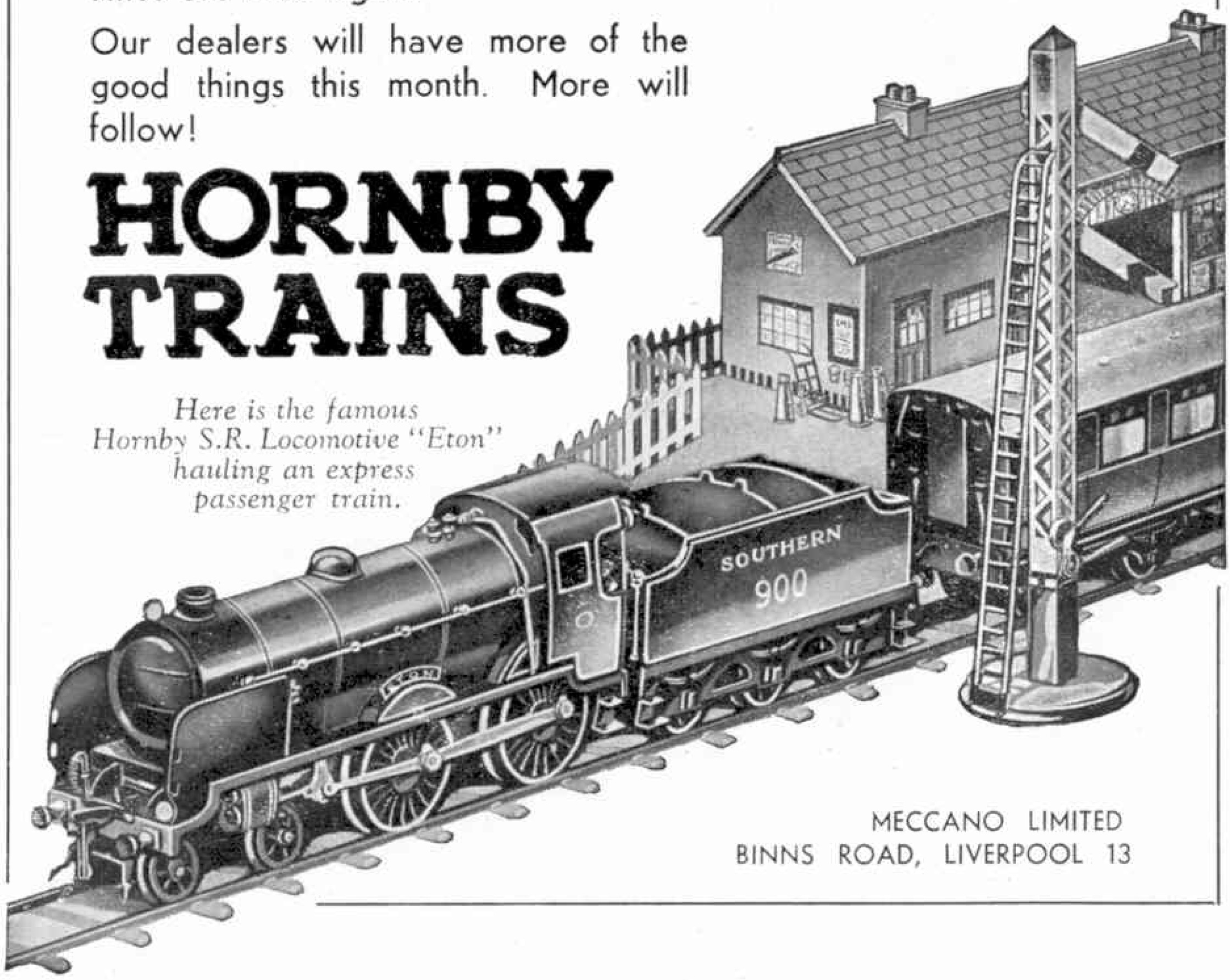

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HORNBY TRAINS

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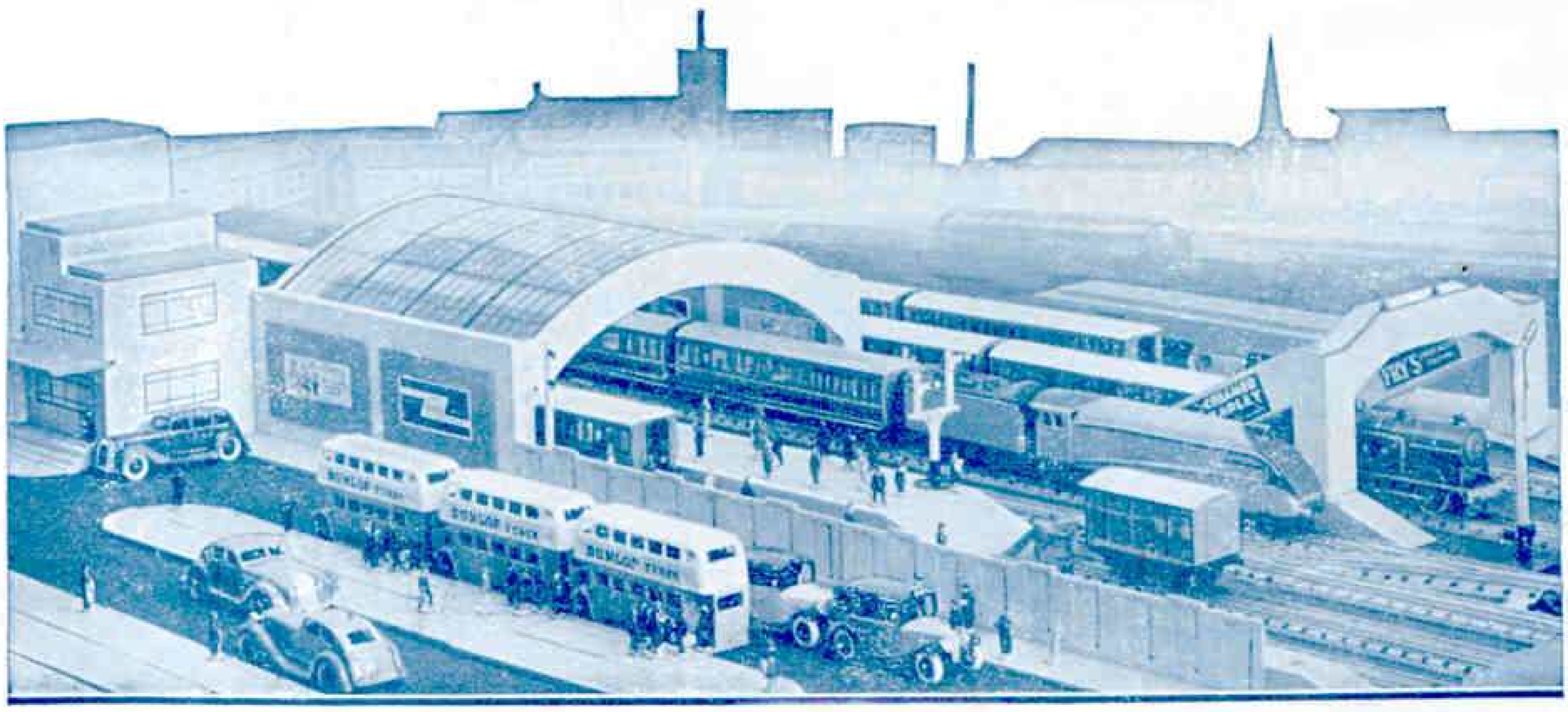

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